# AMERICAN HONEY PLANTS

FRANK C. PELLETT

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Summer's last stand in the author's wild garden at Atlantic, Iowa. Masses of white snakeroot in bloom in October.

# American Honey Plants

Together With Those Which Are of Special Value to the Beekeeper as Sources of Pollen

BY FRANK C. PELLETT

Author Beginner's Bee Book, Productive Beekeeping, Practical Queen Rearing, Etc.

155 Illustrations



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To my indulgent parents,
who early encouraged me
in my passion for the study
of Nature, this book is affectionately
dedicated.

# FOREWORD

In the first volume of American Bee Journal, published in 1861, appears a plea for the publication of a volume devoted to the honey flora of America. In numerous instances since that time, writers have mentioned the great need of a work of this kind. In common with other students of beekeeping, the author came to feel this lack in our beekeeping literature. This book is an attempt to fill that need. It is to be expected that the first work on this great subject will overlook many things which should have been included and that numerous errors should creep in. In an attempt to gather the desired material, the author has visited the important beekeeping regions from the Atlantic Coast to California and from Canada to Florida and Texas. Careful notes have been made of the honey plants of each section as indicated by the many beekeepers with whom the author has come in contact. To this multitude of beekeepers who have thus assisted by furnishing notes of this kind the author is greatly indebted.

The literature of beekeeping has been carefully examined for references to honey plants, and hundreds of quotations appear in the text. The few bulletins which have appeared on the subject have been quoted freely, as well as similar material appearing in the bee magazines

The illustrations are for the most part from the author's original photographs, although a number have been borrowed from the American Bee Journal, which appeared in that publication, from John H. Lovell, Homer Mathewson, J. M. Buchanan, M. C. Richter, C. D. Stuart, Florida Photographic Concern, Wesley Foster, W. A. Pryal, and some others, the identity of the originator of which are lost.

Since most of the readers of this book will be men who are not accusnomed to botanical classification, it has been thought best to treat each plant under the name by which it is most widely known, giving other names as cross references, and to treat all in alphabetical order. Numerous related subjects which seemed to have a place in a book of this kind, such as nectar and nectar secretion, poisonous honey, propolis, pollination, weather and honey production, etc., have been likewise included in proper alphabetical order.

No one is likely to be more conscious of the shortcomings of the volume than is the author. As it is his hope to expand the scope of the work in a later edition, he will be grateful for notes on additions and corrections from all parts of America.

Hamilton, Ill. FRANK C. PELLETT.
November 18, 1919.

# AMERICAN HONEY PLANTS

The late Prof. A. J. Cook estimated that there are nearly eighteen hundred species of plants on which bees work in America. Most of these are minor sources, which the bees visit incidentally for the minute quantity of nectar that may be available, or for pollen. There are some plants rich in nectar which can never be important to the beekeeper because they are not sufficiently plentiful.

Honey production, as a business enterprise, is dependent upon a few species which yield nectar abundantly and which are sufficiently common to enable the bees to secure honey in large quantity. In order to make the most of his business, the beekeeper should have a thorough knowledge of the honey plants in all the country surrounding his apiaries. It often happens that a distance of but a few miles makes a great difference with the available honey sources. Many a man by moving an apiary a few miles has greatly increased the yield. It sometimes happens that the plant which is the main dependence will fail, and that by moving to some other source, a crop may be harvested. To know fully the honey plants of his region, their time of blooming and habit of nectar secretion under his particular conditions, is of fundamental importance to the man who would succeed as a beekeeper.

In many places the presence or absence of a single plant determines whether or not beekeeping is worth while. Over a large portion of the Middle West, the beekeepers depend almost entirely upon white clover for surplus, and in seasons when this plant fails they get no honey to sell.

Likewise, in many localities in the irrigated regions of the Rocky Mountain States, when alfalfa fails to yield, there is no surplus honey. Yet in all these sections, beekeeping would be impossible if there were no other plants. There are localities where tremendous honeyflows occur for a short period of time, where beekeeping is not practical because there is insufficient forage to support the bees the rest of the year. In such places beekeepers often take advantage of the flows by moving the bees away as soon as the plants cease to yield nectar, and returning them the following year at blooming time. This applies to some parts of the valley of the Appalachicola River in Florida. While the flow from Tupelo is sometimes remarkable, there is a shortage of pollen throughout the summer months.

The ideal situation for beekeeping is one where there are at least three plants which yield surplus honey in considerable quantity, and which bloom at different periods. Beside the main sources, there should be a great variety of minor plants yielding both pollen and honey throughout the season to support the bees between the main flows. In such a situation, there is seldom an entire failure of the honey crop; and, in good years, the beekeeper fares well, indeed.

There are many localities where the bees suffer seriously for lack of pollen at some seasons of the year. An available source of pollen is

second only in importance to an abundant honeyflow. This being the case, the plants which are generally regarded as valuable for pollen, especially those blooming at seasons when pollen is not abundant generally, are included in this book.

## HONEY PLANT REGIONS

Several attempts have been made to outline the principal regions of the United States. A careful examination of all these outlines brings out serious discrepancies. There are too many small regions within larger ones to permit of anything like accuracy with the present data and the present knowledge of the honey plants. In general, white clover may be said to be the principal honey plant of all the region from Nova Scotia west to eastern Dakota and south to Tennessee and Arkansas. Yet within that large area, there are many places where white clover is unimportant, and where other plants furnish the principal surplus. In much of Michigan white clover is of first importance, yet in the cut-over districts of the northern part of the State, raspberry, fireweed and milkweed furnish nearly all the honey that goes to market. It is good clover territory, and with the ultimate development of the region, clover will predominate.

In the irrigated regions of the Rocky Mountain States, alfalfa is the principal source of surplus, but sweet clover is rapidly crowding it for first place.

Basswood was once a very important source of honey over all the Northeastern States. The cutting of the basswood forests has gradually reduced the basswood area until there are now few localities, in Ohio, Indiana, Illinois or Iowa, where it is really an important honey source. In parts of Minnesota, Wisconsin, Michigan and Ontario, basswood is still sufficiently plentiful to yield large quantities of honey, but there it is being rapidly reduced.

In the cotton belt, where cotton would naturally be expected to be the principal source, the area would be divided into many small regions. Cotton may yield much honey in a locality where the soil is heavy and rich, while a few miles distant, where soils are light and sandy, there is little honey from cotton, although the plant is just as commonly cultivated. In the cotton region there would be a great many sub-divisions. In parts of Texas, mesquite is the principal source, in others catsclaw and huajilla (wa-he-ya), while in eastern Texas basswood yields heavily. Buckwheat is important principally in the region about the Great Lakes and south in the higher elevations to Virginia and Tennessee. Goldenrod is one of the most important sources of nectar in New England, while it is seldom of much value west of the Mississippi River, although growing abundantly.

In California and Florida there are several entirely different regions within the State. There is no one plant of major importance over all parts of either State. A large amount of work still remains to be done before the honey resources of America can be mapped out with anything like accuracy. Changing conditions are rapidly removing one plant and

substituting another in many sections. When the author visited west Texas he was told by the beekeepers there that the clearing of the land and planting it to cultivated crops was rapidly curtailing the bee range, as no cultivated crops being planted were equal to the desert flora which was being removed.

In other sections, the planting of forage crops which are good sources of nectar, like alfalfa and sweet clover, is greatly increasing the available bee pasturage. In parts of California, the extensive growing of garden seeds is providing pasture sufficient for producing surplus honey of a kind seldom heard of in the markets a few years ago. Parsnip and celery honey are examples.

## THE MINOR PLANTS

Although only a few dozen plants are important sources of surplus honey, there are hundreds of minor plants which are of value for the support they give the bees when no major plant is in bloom. The number and variety of these plants will largely determine the value of the locality, and whether it will be necessary for the beekeeper to resort to migratory beekeeping at times.

Fig. 1. Blossoms of huisache (*Acacia farnesiana.*)

Catnip is famous as a bee plant, yet it is doubtful whether a single pound of catnip honey was ever stored in America, unmixed with honey from other sources. If catnip could be grown in large fields like clover, it is probable that catnip honey would appear in the markets.

If the beekeeper is familiar with the minor plants, he will often be able to locate outyards where the bees will be able to gather enough nectar from such sources to keep his colonies in the best possible condition for the surplus flows. It is a well-known fact that it is only the big colonies which produce large crops of surplus honey. A little nectar coming to the hive for some time in advance of the main flow, is the best possible stimulant for brood rearing. It often happens that bees will be poorly prepared for the harvest in one yard, while others only two or three miles distant will be in the best possible condition, because of the presence of some minor plants not within reach of the first.

# A

## ACACIA.

The acacias are shrubs or small trees which are widely distributed throughout the warmer portions of the world. There are said to be 450 species, of which nearly 300 are native to Australia and Polynesia. We also find reference to them in India, Africa and South America. The

Fig. 2. *Acacia melanoxylon.*

different species are known by various local names. In Europe some are known as mimosa trees. As sources of honey they are important in Texas, Arizona, New Mexico and California.

The sweet acacia **(Acacia farnesiana),** in Texas called huisache, is found along the gulf coast in Alabama and as far east as South Carolina. In Texas the huajilla **(Acacia berlandiera),** is an important source of nectar. In fact, according to the Texas bulletin on honey plants, it is the main source in southwest Texas. It grows abundantly on dry and rocky hills which often are not suited to growing agricultural crops. The honey is white and of fine quality.

The catsclaw, or paradise flower **(Acacia greggii),** is another very important source of honey in the southwest. It is one of the principal

sources of dependence in Texas, where it is reported as yielding in April. Arizona reports a later yield, blooming here in May and June. Like the huajilla, the honey is light colored and of very fine quality.

Fig. 3. Golden wattle (*Acacia longifolia*).

Figure 4 shows the black wattle of California **(A. decurrens mollis),** which is largely grown as an ornamental in the gardens and along the roadsides of that State. It blooms from February to June and produces some honey and an abundance of pollen. Fig. 3 is the Sydney golden wattle **(Acacia longifolia),** another widely-grown California shrub. A third California species, **A. melanoxylon,** is shown at Fig. 2.

The huisache **(A. farnesiana),** Fig. 1, already mentioned, is a common plant in south Texas, from San Antonio to the lower Rio Grande valley.

Fig. 4. Acacia or black wattle (*Acacia decurrens mollis*).

It is of special importance for early pollen, though Scholl reports it as yielding honey also.

The huajilla (pronounced "wa-he-ya") grows abundantly over a wide territory in southwest Texas and, as it requires but a small amount of moisture, makes beekeeping profitable where it would otherwise be a precarious business. Large quantities of white honey of mild flavor and fine quality are stored from this source. In a journey of several hundred miles among the beekeepers of Texas, the author found this plant, together with catsclaw and mesquite, to be the principal source of surplus south and west of San Antonio. Various sources were reported, but in nearly every case these three plants were mentioned as heading the list. Huajilla ranks high in both quantity and quality of nectar produced.

The catsclaw **(Acacia greggii),** known in some localities as paradise flower or devil's claw, is a low spreading, bushy shrub or small tree with curved thorns, hence the name, "catsclaw." This is a close rival of huajilla for first place as the source of white honey in much of southwest Texas. The far-famed Uvalde honey is largely huajilla and catsclaw. In many places the yield of surplus honey is being reduced through the clearing of the land for farming purposes. Both these plants grow in very dry sections, on land which until recently was thought to be of little value for any purpose without irrigation.

Scholl lists the round-flowered catsclaw **(Acacia roemeriana Schlect)** as a heavy yielder of honey of good quality, but plants are not abundant. He also lists **Acacia amentacea** as a source of pollen and some honey, but not in sufficient quantity to be important.

**ACER, see Maple**
**ADAM'S NEEDLE, see Yucca.**
**AESCULUS, see Buckeye.**
**AGARITES, see Barberry.**
**AGAVE, see Century Plant.**

**ALABAMA—Honey Sources of.**

There is a large district in Alabama where sweet clover is the principal source of surplus honey. In this region good crops are the rule, since it yields from early June till late in August. In addition, rattan, tulip-poplar, black gum, hawthorne, field peas, privet, locust, redbud, cotton, bitterweed, asters and occasionally white clover, yield honey. There is the usual spring stimulation from fruit blossoms and willows in Alabama and a large number of minor sources which add something to the total yield, but which alone are unimportant.

**ALASKA—Honey Sources of.**

By the accounts given in Bancroft's History of Alaska and in translations made for me by Rev. George Kotteometinoff from the records of the Orthodox Russo-Greek Church at Sitka, the honeybee was first introduced into Alaska in 1809 by a monk named Cherepenin. These bees came from the Department of Kazan, in Siberia, and were brought that honey might

be added to the scanty food supply of the pioneer teachers of the Faith as well as to supply the candles for the church services. By decree of Church, only beeswax candles can be used, and it is recorded that at Sitka,

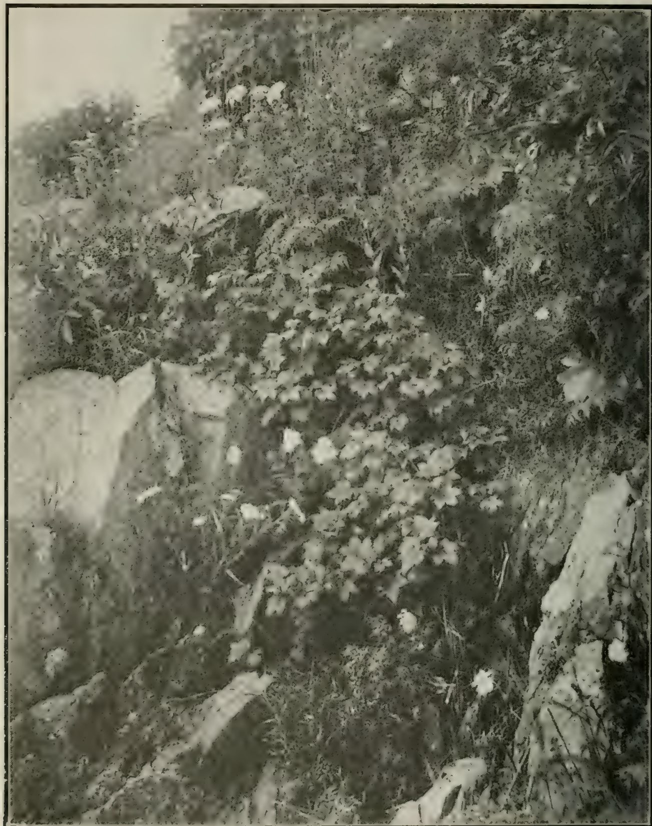


Fig. 5. A group of Alaska honey plants.

in 1816, no services could be held for six months because the supply of wax ran out. As early as 1819 apiculture was taught in the church school and was continued up to 1894. It would appear that the bees never flourished and seldom swarmed. There are a number of records of new importations to take the place of dead colonies. Very early a white clover was intro-

duced to help out the honey supply. About 1830 bees were taken from Sitka to Fort Ross in California. As late as 1905 there were about 30 colonies at the Russian school at Sitka. These bees were in straw skeps and were kept on shelves under the eaves of the house. In winter they were kept within the same projecting eaves. In 1906 the Experiment Farm at Sitka made an unsuccessful attempt to keep bees in Langstroth hives. It is not probable that beekeeping will ever be a commercial project in Alaska. References to beekeeping at Sitka by Dr. Sheldon Jackson are to be found in the Report on Education in Alaska, Bureau of Education. Prof. C. C. Georgeson, in the reports on work done at the Experiment Station in Alaska also mentions beekeeping. Bees were observed collecting nectar and pollen from plants given below during the years 1905 to 1912. It should be observed that a majority of these plants have pendulous flowers. In a climate such as at Sitka, where the normal precipitation is 120 inches, only pendulous flowers could protect the nectar:

Willow **(Salix speciosa).**
Crab Apple **(Pyrus rivularis).**
Salmon Berry **(Rubus spectabilis).**
Salmon Berry **(Rubus nutkonus noctino).**
Cloud Berry **(Rubus Chamaemorus).**
Nahgoon Berry **(Rubus stellatin).**
Wild Red Raspberry **(Rubus strigosus).**
Blue Berries **(Vaccinium uliginosum).**
Blue Berries **(Vaccinium ovalifolium).**
Blue Berries **(Vaccinium vitis Idaea).**
Seaside Portulaca **(Claytonia sp.)**
White Clover **(Trifolium sp.)**
Wild Tansey **(Achillea borealis).**
Yellow Water Lily **(Nymphaca advena).**
Water Smart Weed **(Polygonum sp.)**
Elder **(Sambucus racemosa).**
Cow Parsnip **(Heracleum lanatum).**

—H. B. Parks.

**ALBERTA—Honey Sources of.**

In the southern part of the province alfalfa is of first importance. Fireweed, white clover and alsike are the chief sources elsewhere. Willows and maples stimulate early brood rearing and some honey is gathered from prairie flowers.—F. W. L. Sladen.

**ALDER (Alnus).**

The alders are a group of shrubs or trees common from New England and Canada west to Michigan and south to Texas. The bark is sometimes used for tanning and as a dyestuff. and to some extent in medicine. The blossoms appear early in spring, and are the source of an abundant supply of pollen at a season when it is often much needed by the bees.

**ALFALFA (Medicago sativa).**

Alfalfa is the most important honey plant west of the Missouri river. It is also the most valuable forage plant in the same region. Once established, a field of alfalfa continues to return valuable crops year after year.

Fig. 6. Pollen-bearing blossoms of the alder.

From two to five cuttings are secured each season, depending upon the available moisture and the length of the growing period. It thrives best in the irrigated regions with its roots in the rich soil supplied with abundant, but not excessive, moisture. It is an old-world plant which has contributed much to the prosperity of western farmers since its introduction to this country.

The honey from alfalfa varies in color and quality in different localities. In Colorado and Idaho it is of very light color and with a spicy, mild flavor of excellent quality. In the Imperial Valley of California it is much darker in color and of poorer quality. Alfalfa honey granulates readily, but is generally regarded as a high quality of honey. The tendency to early granulation makes it more desirable to market in the extracted state than in the sections.

The yield varies greatly, according to season, but the heaviest yields come when there is a vigorous growth of the plant. Where grown without irrigation a much greater variation in yield can be expected. In Nebraska and Kansas, alfalfa often yields good crops of nectar without irrigation, while east of the Missouri River it is seldom of much value to the beekeeper. The author had a small field of alfalfa in western Iowa for

several years. Only one season did the bees pay much attention to it. That season was very wet in the early part of the summer, thus promoting a vigorous plant growth. Later the weather turned very hot and dry. Conditions similar to those of the irrigated sections of the west were approximated. The roots of the plants were supplied with an abundance of moisture, while the air was hot and dry. Under such conditions alfalfa is at its best as a honey producer.

Alfalfa is reported as the source of considerable surplus honey in northeastern Louisiana, which is the farthest east of any locality where it is important, with which the author is familiar. While it is largely grown

Fig. 7. Blossoms of alfalfa and yellow sweet clover.

as a field crop in parts of Iowa, Illinois, New York and other eastern States, beekeepers all report but little honey from it. It seldom yields to any extent in humid climates. Given sufficient moisture at the roots, the hotter and dryer the atmosphere, the better seems to be the yield of nectar. The conditions which most favor nectar secretion are also favorable to seed production.

### Field Culture

Alfalfa is a long-lived plant and very deep-rooted. The long tap root penetrates deep into the soil, thus securing all available moisture and making the plant drought-resistant when once well established. The plant is very tender when young, and great care is necessary in the preparation of the soil when starting a new planting of this crop. The seed bed should be thoroughly stirred, all lumps fully pulverized, and the surface soil as smooth as an onion bed. It is important that the ground be prepared some time in advance of seeding and frequently stirred to start any weed seeds that may be present, and destroy them before the alfalfa is sowed. On old land it is advisable to prepare the seed bed in the spring and stir it at frequent intervals until August before sowing the alfalfa seed.

Alfalfa does not do well on sour land, or land that is wet or weed-infested. It does best on rich, well drained soil, well supplied with lime. Lime is essential, and if the soil is lacking in lime it must be supplied.

In many localities it is the practice to grow a crop of sweet clover in advance of seeding to alfalfa.

From seven to twenty pounds of seed are required per acre. If good seed is used and put in with a drill, ten to fifteen pounds should be ample.

In cutting alfalfa it is important that some care be used to select the proper time. When the new shoots are well started is usually regarded as the safest time, if the plant is cut for hay. The leaves constitute the greatest portion of the feeding value, and much care is necessary in handling the crop to avoid shattering.

In localities where the plant is grown for seed, a much longer blooming period results and the beekeeper profits accordingly. Where cut for hay, alfalfa loses much of its possible value through the cutting just when it is reaching its period of greatest nectar secretion.

Harry K. Hill, of Willows, California, states that he gets three distinct shades of pure alfalfa honey in the same year. The honey from first extracting is much darker than later extractings.—Western Honeybee, April, 1913.

**ALFILARIA, see Pin Clover.**
**ALGAROBA, see Mesquite.**
**ALLIGATOR PEAR, see Red Bay.**
**ALLIUM, see Onion**

### ALMOND (Prunus amygdalus).

The cultivated almond is closely related to the peach and is native to Southern Europe, where it has been grown for centuries for its nuts.

The tree is extremely early in its blooming period and more tender than the peach. It is grown in large orchards in parts of California, and to some extent in Arizona. It grows on higher and dryer lands than any other fruit trees in California. The tree will not thrive on wet lands.

Bees gather both honey and pollen from the flowers and in the almond belt of California it is of great value for early brood-rearing. There it

blooms in February, and beekeepers sometimes move their bees from a distance to the almond orchards to build them up for the orange flow.

**ALSIKE CLOVER (Trifolium hybridum). Hybrid or Swedish Clover.**

Alsike clover is one of the very best honey plants of America. The beekeeper who lives within reach of large fields of this crop is fortunate, for there is no better honey, and under favorable conditions the crops harvested from alsike are such as to give little ground for dissatisfaction. Some beekeepers have estimated that alsike will produce 500 pounds of honey per acre in a good season.—American Bee Journal, page 409, 1886.

Alsike thrives on clay soil, or lands inclined to be wet, where the other clovers do not succeed. It is sown very generally in a meadow mixture with timothy or red-top. In localities where grown for seed there is a long period of bloom, which is greatly to the advantage of the beekeeper. It is good for either pasture or hay, and although by itself alsike does not yield as many tons of hay per acre as red clover, when mixed with red clover the two together make more and better hay than red clover does alone.

Fig. 9. Alsike clover.

Alsike is intermediate in size between white and red clover. The blossom looks like that of white clover, except it has a pinkish tinge of color not found in the white clover. The stem is upright and branched and on land with sufficient moisture reaches a height of two feet or more.

While alsike will grow nearly everywhere that red clover will grow, it thrives best in the northern part of the country. Minnesota, Wisconsin, Michigan, Ontario and New York all report alsike as especially valuable to the beekeeper.

The honey is white in color, mild in flavor and is regarded as one of the best for table use. At times the yield is very heavy. In American Bee Journal, Nov. 2, 1899, are given several instances of large yields from this source. In one case a single colony of bees gathered 72 pounds in four days, or 18 pounds per day. Another report was of 251 pounds in 21 days, or 25 pounds per day, from alsike.

In number two of the first volume of the "Review," Editor Hutchinson states that ten colonies of bees gathered 300 pounds of extracted honey from alsike, with only two acres within reach. This, of course, takes no account of the honey consumed by the bees, but indicates that the yield is good for the acreage within reach. In the following number of the same journal an Ontario beekeeper reports that he had not known a failure from alsike in eight years.

See also Clover.

**ALTHEA, see Hollyhock.**

**ANDROMEDA.**

"Andromeda (a scraggy shrub of the heath family) blooms in the central northwestern part of Florida for about four weeks in March and early April; yielding but little, three years out of four. The honey, too, is reddish yellow, thick and pungent, not very valuable as a surplus honey plant."—E. G. Baldwin, Gleanings, March 15, 1911.

**AMERICAN ALOE, see Century Plant.**
**AMERICAN CRAB APPLE, see Crab Apple.**
**AMERICAN IVY, see Virginia Creeper.**
**ANAQUA, see Knockaway.**
**ANGLEPOD, see Bluevine.**

**APPLE (Malus).**

America's best and most widely used fruit is the apple. It is a native

Fig. 8. Almond orchard in bloom.

of Asia, but as a cultivated fruit is grown in most of the temperate regions of the world. Hundreds of varieties have been developed by plant breeders until there are few horticulturists who are familiar with them all. They range in size from the small cultivated crab-apples not more than an inch in diameter to the big Wolf River, often five or more inches in diameter. Some varieties are hard and sour and suitable for little else than making cider, while others are of the finest quality.

There is no more beautiful sight than an orchard in bloom in spring. The blossoms secrete nectar freely and in favorable weather the bees fairly swarm over them. The honey is light amber in color and of good

quality. The trees bloom so early that it is of greatest value to stimulate spring brood-rearing, though strong colonies easily store surplus when the weather is suitable for the bees to fly freely during the period of bloom. Large orchardists often offer inducements to beekeepers to locate near their orchards for the better pollination of the fruit blossoms which results from the presence of large numbers of bees. In orchard districts there is frequently complaint on the part of the beekeepers that the bees are killed by the application of poisonous spray while the trees are in bloom. When American beekeepers learn to winter their colonies in such a manner as to maintain a reasonable strength in early spring, surplus honey in quantity may be expected from the orchard districts in favorable seasons. The weather is often too wet or too cold for the bees to fly during apple blossom, and this condition the apiarist can never overcome.

**APOCYNUM, see Dogbane.**

**APRICOT (Prunus armeniaca).**

The apricot is a well known cultivated fruit, somewhat intermediate between the plum and peach. It blooms very early in spring and is valuable as a source of early nectar and pollen. It is grown in large acreage in some portions of California, where it is regarded as valuable, by the beekeepers.

**ARBUTUS (Epigaea repens).** Trailing Arbutus or Ground Laurel.

A trailing plant with evergreen leaves. The rose colored flowers, in small clusters, appear in early spring. They are fragrant and attractive to the bees. There is an occasional report to the effect that arbutus is valuable to the bees as a source of early nectar.

**ARCTOSTAPHYLOS, see Manzanita.**
**ARIZONA BUCKTHORN, see Gum Elastic.**

**ARIZONA—Honey Sources of.**

The sources of our honey are the desert flora and cultivated crops, chiefly alfalfa. A few of the principal producing plants and their seasons are as follows:

| | Time of Blooming. |
|---|---|
| Mesquite **(Prosopia velutina)** | April-July |
| Screw Bean **(Prosopis pubescens)** | April-July |
| Catsclaw **(Acacia greggii)** | May-June |
| Acacia **(Acacia constricta)** | June |
| Paloverde **(Parkinsonia torreyana)** | May |
| Desert flora **(Miscellaneous)** | Depending upon rainfall |
| Alfalfa **(Medicago sativa)** | April-September |

The wild honey plants, because of grazing animals and of wood-cutters, have greatly decreased within recent years. The area in alfalfa, on the other hand, is constantly increasing; but without a corresponding increase in honey-producing power. This is due to two principal causes: Farmers

are now cutting alfalfa for hay at a much earlier stage in its growth than formerly, not allowing the plant to come into full bloom; and the alfalfa butterfly (Colias eurytheme), has so increased in numbers since 1895, that the honeyflow, which used to continue well into September, is now cut short in July. It is difficult to state the net effect of these changes upon the producing power of the country as a whole; but in Salt River Valley, under present conditions, judging from the shipments made during the last few years, our present irrigated areas, with adjoining desert tracts, are pretty fully stocked with bees. Other parts of the territory are as yet less thoroughly occupied.—R. H. Forbes, University of Arizona. "Timely Hints for Farmers," No. 46.

**ARKANSAS—Honey Sources of.**

White clover is the source of some surplus in Arkansas, although it is too far south for such heavy yields as occur in the northern part of the range of this plant. Sweet clover is valuable in some localities. Tupelo, holly, blackgum, redbud, locust, tulip-poplar, blackberry, heartsease and asters are the important sources of nectar. Cotton yields in some sections of the State. Fruit bloom is valuable in spring, and where colonies are sufficiently strong some surplus may be expected.

**ARTICHOKE, see Sunflower.**
**ASCLEPIAS, see Milkweed.**

**ASPARAGUS.**

The garden asparagus is an introduced plant widely cultivated. It is very attractive to the bees and yields pollen plentifully. As a source of nectar it is unimportant.

**ASH (Fraxinus).**

There are more than twenty species of ash trees common to various sections of America. Some are well known timber trees, furnishing lumber for furniture and for interior finishing. The flowers are small, inconspicuous and of a greenish color. Their principal value to the beekeeper is as a source of pollen, although Richter lists the Oregon ash (**Fraxinus oregona**) as a source of honey also.

**ASH LEAVED MAPLE, see Box Elder.**

**ASPEN (Populus).** Poplar or Cottonwood.

There are several species of poplars. It is a widely distributed group, some species being found in most all sections of the country. They are important for pollen, though some honeydew is reported from them also. They thrive especially well on the low lands along streams and are the most common trees of the plains region from Dakota south to Oklahoma and western Texas. This group should not be confused with the tulip-poplar, which see.

**ASTER.**

The aster family is very widely distributed, being common in Europe, Asia and South Africa, as well as America. There are more than 200 rec-

Fig. 10. White field aster (*Aster vimineus*).

ognized species, of which at least 125 are found in the United States. They are extremely common in the Eastern and Southern States, although some kinds are to be found in every State in the Union, and from Canada

to Mexico. Every American beekeeper may be sure that his bees are within reach of at least one species of aster, and, in most localities, there are several species. Some species produce nectar much more abundantly

Fig. 11. Purple stemmed aster (*Aster puniceus*).

than others, and it is probable that the flow from all kinds is more or less affected by soil or climatic conditions. So few beekeepers differentiate between the species that it is very difficult to secure satisfactory information regarding their comparative value.

Asters are very seldom mentioned as sources of nectar in the southwest. Yet twenty-one species are listed as occurring in New Mexico. They seem to be of importance principally in the Eastern States. There are numerous reports of honey from asters in the Southeastern States of Georgia, Alabama and Mississippi, the amount of surplus increasing northward.

In most localities, the aster honey is mixed with that from goldenrod, and the two sources are usually spoken of together. In the September, 1917, issue of the American Bee Journal, appeared an extended article on goldenrods. Like the asters, they are of wide distribution, and, like them, they seem to produce nectar more abundantly in the moist climate of the Eastern States. Both bloom late in autumn, the crop often being cut short by frost.

Fig. 12. Large-leaved aster (*Aster macrophyllus*).

According to Lovell, the asters are never common enough to yield a surplus in Maine, and the honey is always mixed with goldenrod.

As to the quality of the honey, there are many conflicting reports. Many reports are to the effect that the quality is poor and not suitable for table use. The fact that the honey is seldom unmixed with that of other fall flowers, may be responsible for this impression. C. P. Dadant had one year, in Illinois, a crop of about six barrels which was almost pure aster honey. This honey was secured late in the season, after other plants had ceased to yield, and was almost white, and of very fine quality.

There are numerous reports that a strong odor is apparent in the apiary when asters are yielding. We quote some of these:

> "We had a fall flow from wild asters that filled the hives with honey for wintering, and gave a few gallons of extracted honey. The honey is of good color and weight, but rather strong for table use. It also granulates very quickly. When the bees are gathering this honey the hives give off a rank and somewhat sickening odor, which can be detected for quite a distance away. * * * This odor disappears as the honey ripens and the flow ceases, but the strong taste never entirely disappears. It is as strong as basswood and not nearly so pleasant."—D. E. Andrews, Bloomington, Ind., page 98, American Bee Journal, 1907.

> "The odor is not unpleasant, but is very noticeable when the bees are bringing much of it in, and it can be distinguished a considerable

distance from the hives. The amount of 'smell' is such a good criterion as to the amount of honey that one can tell the quantity he is getting from these indications alone."—W. H. Reed, Herrodsburg, Ky., page 228, Gleanings, 1911.

"In the Shenandoah Valley, in Virginia, where I lived for fourteen years, there were many acres of white aster. There were several years when the bloom was in sheets, affording a good yield of surplus. The honey was very light amber, of fine quality, and was considered next to white clover. At such times a strong odor, which was distinctly sour, could be noticed."—Burdet Hassett. Page 257, Gleanings, 1911.

Much has been written concerning the danger of aster honey for winter stores. So many reports of disastrous results from wintering on aster honey have been published, that it is generally understood not to be safe for winter stores. However, it is probable that the trouble comes from honey gathered too late to be properly ripened, rather than because the honey is of poor quality. The fact that the honey granulates readily also probably accounts for the trouble in some cases.

In some localities, asters seem to be a dependable source of surplus, while in others they yield in appreciable quantity only in rare seasons. Kentucky seems to be in the heart of the territory where asters are important. The following are typical reports:

Fig. 13. Arrow-leaved aster (*Aster sagittifolius*).

"We have never failed to get a good crop of surplus honey, and plenty left for the bees, from aster for more than twenty years, till this year."—H. C. Clemons, Boyd, Ky. Page 90, Gleanings, 1909.

"In this section the asters are invaluable as fall forage for bees. Let the season be cold or hot, we are certain to have a continuous bloom from early in September until a really hard frost occurs. My Italian bees have never failed to secure enough honey from aster to carry them through the winter, even when there was hardly a pound of honey in the hives at the end of August—Daniel M. Worthington, Elkridge, Md., American Bee Journal, page 125, 1869.

"Blue aster **(Aster azureus),** known among farmers as blue devil, or stickweed, in my judgment, is one of the best we have, from the fact that it produces honey in the fall of the year. It is usually in full bloom until about the middle of October, and if the weather is warm enough for the bees to fly, they get plenty of honey to winter on from this flower."—West Virginia. Page 869, American Bee Journal, 1906.

It is probable that most of the species are of more or less value for honey under favorable conditions. The writer has seen bees working on arrow-leaf **(Aster sagittifolius)** on sunny days in Cass County, Iowa, the first week in November, after everything else had been killed by frost. Figure 13 shows this species, which occurs in dry, open woods, from New Brunswick to Ontario, and west to Dakota, and from New York to the Ohio valley, and along the mountains to Georgia and Alabama.

Generally speaking, the small-flowered species with willow-shaped leaves, are best for honey. **Aster tradescanti** is probably first in the list as a source of surplus. It is found from Ontario to Saskatchewan, and throughout the States east of the Mississippi, south to the Gulf States. **Aster salicifolius** is probably one of the best in Iowa and Illinois, being common on low ground.

In a private letter, F. W. L. Sladen writes concerning the asters in Canada, as follows:

> "I have this year had confirmation that **Aster cordifolius** is a useful source of surplus honey in favorable seasons in the Gatineau valley in September. During a period of very fine weather between September 11 and 22, a crop of 12,000 pounds of honey, principally from this source, and from the late flowering species of goldenrod, was obtained by Joseph Martineau, at Montcerf, Quebec, from 300 colonies. The honey was light amber color, and a pleasant flavor, and not unwholesome for wintering, not granulating in the combs. (See Experimental Farms report 1914-15, page 996). Other valuable species of aster in Canada for honey production are **A. lateriflorus** (Maritime provinces to Ontario); **Aster umbellatus** (Maritime provinces to Eastern Manitoba), and **Aster puniceus,** Fig. 11 (Maritime provinces to Ontario)."
> —Ottawa, October 2, 1917.

F.g. 14. Swamp aster (*Aster acuminatus*).

**Aster puniceus,** the purple-stemmed aster, Fig. 11, is found from Nova Scotia to the Rocky Mountains and south to Northern Alabama. It is one of the most attractive of the asters, growing on wet land and in the borders of swamps. Lovell writes that in Maine he has seen the bees on this species in large numbers on September 17.

The white field aster, or frost flower **(Aster vimineus), Fig. 10, is** common from Eastern Canada to Minnesota, and south to Arkansas and Florida. It grows in dry, open fields, along roadsides, and in waste places. It is a late bloomer, belonging to the group of field asters which are important for nectar. Some other species, however, yield more freely.

The swamp aster **(Aster acuminatus)** occurs on wet land, but as far as available information goes is not valuable for honey.

The large-leaved **Aster macrophyllus,** Fig. 12, is a northern species, found in open woodlands. Graenicher observed ninety-five species of insects on the flowers of this species in Wisconsin, which indicates nectar in abundance in that State.

Several other species are known to produce nectar freely, **A. multiflorus, A. lateriflorus, A. dumosus, A. paniculatus** and **A. vimineus** being reported from various localities. **A. ericoides** is reported as valuable in Missouri.

> "There is an abundance of **Aster ericoides** now in full bloom. The bees are working on it more vigorously than they have on white clover or any other bloom."—George E. Wilkins, Wright County, Mo. Page 699, American Bee Journal, 1904.

So far, we have been unable to find any records of surplus honey from asters west of the Missouri River.

**ASTRAGALUS, see Loco Weed.**

**AZALEA (Rhododendron).**

The azaleas are closely related to the mountain laurel and are likewise sometimes reported as poisonous. (See Laurel; also Poisonous Honey). The flame-colored azalea is common in the mountains of the Eastern States from Pennsylvania to Georgia. It has a profusion of showy, flame-colored blossoms coming just when the leaves appear. Probably several of the group yield nectar in quantity to be important wherever they are sufficiently plentiful.

# B

**BALLOON VINE (Cardiospermum halicacabum).**

The balloon vine is a herbaceous climber with alternate leaves and clusters of small white flowers, followed by a three-celled inflated pod. This species is common along streams in south Texas. **C. molle,** a Mexican species, is also found to some extent in the mountains west of the Pecos River, according to Coulter.

Balloon vine is reported as the source of considerable honey in Texas. Scholl lists it is a fair yielder, but plants not abundant. Other reports indicate that it is the source of considerable surplus along the Gulf Coast of that State.

**BALSAM APPLE, see Wild Cucumber.**

**BANANA (Musa sapientum).**

Since the banana plant is little grown in the United States, it is seldom mentioned as a honey plant, yet it secretes nectar very abundantly, and in countries where bananas are grown on a large scale it must be important to the beekeeper. We are showing herewith two illustrations, one of the plant in fruit and one showing the opening of the bloom.

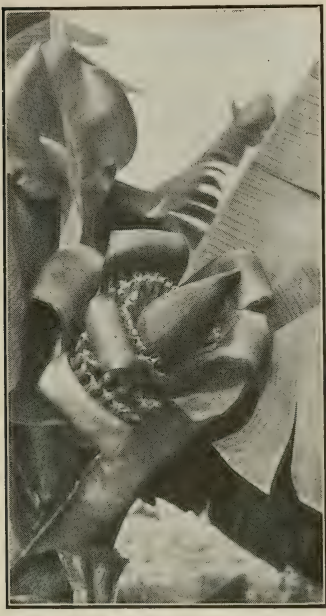


Fig. 15. Blossoms of the banana.

The following description of the possibilities of this plant is reprinted from page 83 of the American Bee Journal for 1880, and was written by a correspondent in Clifton Springs, Florida:

"Recently noticing bees working upon blossoms, I concluded to examine them. To my surprise, I found that each blossom had a sack on its under side, which contained several drops of nectar of the consistency and sweetness of thin syrup. This sack gradually opens, allowing the contents to escape, unless appropriated by some insect. The blossom hangs in a position that rain cannot enter to dilute or wash out the nectar. Procuring a teaspoon, I emptied into it the contents of a dozen blossoms, which filled it full. Each stalk, on good land, will produce a head having a hundred hands or divisions of blossoms, and each hand averages six blossoms, giving 600 blossoms to the stalk. Estimating 100 teaspoonfuls to the pint (88 of the one used filled a pint measure) we have 50 spoonfuls, or half a pint to the stalk. Planted in checks 8x8 feet, there will be 680 plants to the acre, yielding, according to the above estimate, 42½ gallons of nectar. But usually more than one stalk in a hill blossoms and matures fruit annually. The blossoms used were below those that produce fruit, which later, I am told, are much richer in honey.

"The first blossoms which open mature fruit. These vary in number from 25 to 100, according to quality of land, cultivation, etc. They


Fig. 16. The banana.

sell here at from 1½ to 2 cents per finger or pod. Estimating fruit at 25 fingers per bunch and the bunches at 25 cents each—which, you see, is a low estimate for both, the result will be a barrel of nectar, or $170 worth of fruit per acre. How does this showing compare with other cultivated plants as combined honey and money crop?"

Fig. 17. Triple-leaved barberry, or agarita.

**BARBERRY (Berberis).**

The common barberry, introduced from Europe, has become naturalized in the Northern States and occurs in thickets and woodlands from the Atlantic Coast to Iowa and southward. It blooms in May and June and is well known as an attractive plant to the bees, though seldom sufficiently abundant to be important. It is much cultivated for ornament.

In Texas, the triple-leaved barberry **(Berberis trifoliata)** is known as agarites, the Mexican name, and as wild currant. It is common over a large part of the southern portion of the State and is an important source of early nectar. It is a shrub 4 to 6 feet high, with stiff leaves and bright yellow flowers that grow in dense clusters along the stem. The red berries ripen in May and are often called currants. They are used for jelly or sauce, as well as for barberry wine. The plants are to be found in thickets, in open woodlands and along roadsides, in fence corners and other waste places where the seeds have been scattered by birds.

> "As a honey plant it is one of much value to me. It blooms here early in February, and the bloom continues for several weeks, some bushes blooming later than others. The pollen yield is abundant, bright yellow in color. It is the second bloomer of the year on my list of Texas honey plants, coming after mistletoe and before our main fruit bloom."—Louis Scholl, Gleanings, Feb., 1907.

Richter reports the California barberry **(Berberis pinnata)** yields surplus in Monterey County after manzanita has bloomed. The honey is amber in color. The plant is rather common from Berkely Hills south to Monterey, blooming in March and April, according to Jepson. (See also Oregon grape).

Fig. 18. Basswood tree in bloom.

**BARNABY'S THISTLE, see Star Thistle.**

**BASIL or MOUNTAIN MINT (Pycananthemum virginianum).**

Basil is common from New England to the Missouri River and southward. There are numerous reports from beekeepers to the effect that bees work upon it very eagerly from morning till night. It is probably nowhere of much importance, though it would be if sufficiently common.

**BASSWOOD (Tilia americana).**

The basswood, also known as linden, whitewood, and sometimes as limetree, is one of the best known sources of honey in the Eastern States. There are other species closely related which also produce nectar, and which, perhaps, would not be distinguished by the casual observer. The natural range of the basswood is from Canada to Florida and west to Nebraska and Texas. It is also grown as a shade tree in other Western States

and is mentioned by Richter in the bulletin on "Honey Plants of California," as an introduced species of value. Fig. 18 shows the trees in bloom, and Fig. 19 a close view of the blossom and leaf.

Fig. 19. Blossom and leaf of the basswood.

The tree thrives on rich lands, and in the cooler regions of the country reaches a large size. The wood is soft and white and much in demand for making sections, separators and other bee supplies requiring a soft wood cut in thin sheets. For such purposes basswood has no superior. The wood is also sought for use in the manufacture of furniture, packing boxes, etc.; as well as for paper making.

The blooming period is short, seldom yielding to exceed ten days or two weeks, and often for a much shorter period. The honeyflows from baswood are irregular and only to be depended upon about two or three years out of every five. A heavy flow from this source occurs only occasionally, but when it does come it is worth waiting for, for enormous yields are sometimes secured. The honey is white in color, with rather a strong flavor, but is usually regarded as high quality. Good basswood locations are no longer plentiful, as the cutting of the forests over the entire country has resulted in a large reduction of this along with other trees.

The European linden **(Tilia europaea)** has been planted in many places and, according to Sladen, is the source of surplus honey at Charlottetown, Prince Edward Island.

**BASTARD-PENNYROYAL, see Blue Curls.**
**BATCHELOR'S BUTTON, see Centaurea.**
**BAY, see Magnolia.**

**BEAN (Phaseolus).**

There are two varieties of the garden bean which are the source of nectar in quantity. Surplus honey from beans is seldom reported except in Southern California. Ventura County is said to produce as high as 72 per cent of the lima beans raised in the entire United States; 800,000 sacks is the reported output for 1910. The honey from lima beans is almost water white in color and of fine flavor, according to M. H. Mendleson, of Ventura, California, who has produced many tons of this honey. The black-eyed beans yield a dark amber honey, but of good quality. A peculiarity of honey from lima beans is that it will sometimes sweat and ferment when left too long on the hives of weak colonies, near the coast. This, according to Mendleson, seldom happens with strong colonies, nor does it happen in any case in the interior. Honey from beans granulates very readily.

The honeyflow from beans is regarded as very dependable. Occasionally the blossoms are blasted by hot east winds, but not frequently. In Ventura County the average from this source is reported as 50 pounds per colony per year, with as high as 140 pounds in an exceptional season. The beans bloom through a long season, beginning in July and continuing till September, with the principal crop of nectar harvested in July. The bloom is prolonged by irrigation.

The principal counties of California where beans are important are: Ventura, Orange, Santa Barbara, Los Angeles and San Diego.

**BEARBERRY, see Manzanita.**
**BEAVER TREE, see Magnolia.**

**BEE BALM (Melissa officinalis).**

A sweet perennial herb, cultivated in gardens, from Southern Europe and North Africa. Sometimes escaped; flowers yellow or whitish, several in each auxiliary cluster. Plant erect and branching, with broad opposite leaves. Attractive to the bees, but not sufficiently abundant to be important.

**BEECH (Fagus grandifolia).**

The beech is a large tree common to Eastern America. It is known from Nova Scotia to Ontario and southward, sometimes in extensive forests. Its principal value to the beekeeper is as a source of pollen, though honeydew is sometimes secured from the leaves.

**BEEWEED, see Rocky Mountain Bee Plant.**
**BEGGAR TICK, see Spanish Needle.**

**BINDWEED (Polygonum convolvulus).**

The black bindweed is a common weed throughout the Eastern States.

It is of European origin, introduced into this country. It belongs to a family of plants which produce honey in quantity, but, is itself, of little value. The first indication that reached the author that this plant was sometimes of value to the bees, was the receipt of a specimen, by mail, with the information that the bees were working upon it. Careful watch was then kept for several years, before they were seen to seek it in his locality. Since that time there have been a few occasions when the bees have sought it freely and when it seemed to yield some nectar. It is doubtful whether it is ever of much importance as a source of honey.

Fig. 20. The Black bindweed is a common weed.

The seed has been widely distributed with grain seeds and is very troublesome in fields of small grain. The vine closely resembles the wild morning glory, to the casual observer, but the blossom is small and inconspicuous, followed with a seed somewhat like buckwheat, hence it is often called wild buckwheat.

**BIRCH (Betula).**

There are several species of birch trees and shrubs common to Eastern America. They are partial to low, rich woodlands, and some occur in the far north. In some localities they are valuable for pollen.

**BITTERSWEET (Celastrus scandens).** Waxwork, or Climbing Bittersweet.

A well-known climbing shrub common in woodlands. The orange-colored pods displaying the scarlet covered seeds are often gathered for winter bouquets. The flowers are small and greenish in raceme-like clusters at the termination of the branches.

"The bees work freely on bittersweet."—Miss Mitchell, Keokuk, Iowa.

**BITTERWEED (Helenium tenuifolium).**

The author's first experience with bitterweed honey was in south Missouri in 1904 or 1905. There had been a good flow from white clover,

followed by a dearth for a time, and the unfinished sections were filled out with bitterweed honey. The sections looked very nice and a northern

Fig. 21. Honey from bitterweed is unfit for table use.

beekeeper who had recently settled near the town of Salem, innocently sold his honey to the townspeople. The next time he came to town there were numerous persons looking for him, and he found it necessary to take back most of the honey he had marketed on his previous visit. The honey from this source is so bitter that a very little of it will spoil a fine crop of the best white honey. A few cells are sufficient to make a whole section absolutely unpalatable.

On a visit to Tennessee the author was very much interested in this plant, which grows freely along roadsides, in barnyards and similar places, much as dogfennel or mayweed does in the Northern States. The range of the plant is given as from Arkansas and Texas to North Carolina. It probably does not appear to any extent north of Tennessee.

Chas. Mohr says of it (Plant Life of Alabama, page 54):

"The bitterweed, originally from the sunny plains west of the Mississippi River south of the Arkansas Valley, was first observed in Mobile in 1866. It has spread along the embankments of the railroads

> to the mouth of the Ohio River, literally covering in many places the waste and uncultivated grounds, and reaching out along byroads and borders of fields and woodlands. It its northward spread it has largely taken the place of the mayweed **(Anthemis cotula),** a European weed of early introduction."

Regarding honey from this source J. J. Wilder says (American Bee Journal, Vol. 54, page 410):

> "It is truly a nectar-laden plant. Though it does not grow in great fields as yet, bees will store from 30 to 35 pounds of surplus from it. Its flowers are of a deep yellow; the honey, light yellow, heavy body, soon granulates when extracted. It is bitter; in fact it is about as offensive to the palate as quinine. In most sections of the South the cotton plant begins yielding two or three weeks before the bitterweed, and if it were not for the well-established fact that bees do not desert a honey plant for another as long as it yields well, nearly all the summer and fall honey would be unfit for market on account of the bitterweed. In sections where the cotton does not yield much, the honey is all bitter, and a small amount of it will ruin a tank of good honey. Bitterweed is also a great pollen plant, furnishing abundance of bright yellow pollen throughout its blooming period. Even the stems and foliage of this plant are intensely bitter, and no animals eat it."

Pammel cites a quotation which states that it has been reported as fatal to horses and mules in several of the Gulf States. It is said to contain a narcotic poison and to be the cause of bitter milk.

A relative of this plant, the northern sneezeweed **(Helenium automnale)** is also a good honey plant, and probably less bitter than the southern or narrow-leaved sneezeweed just described. Neither, however, can be said to be a desirable addition to the honey-producing flora, because of spoiling good honey from mixing with it. The northern sneezeweed is found in various localities from Connecticut to the Dakotas and southward. It is also found in places in the Rocky Mountain States.

The bitter honey seems to be as good as any for brood-rearing and, where present, the beekeeper should use care to avoid mixing it with his marketable produce, and use it for feeding the bees. The bitterness is said to come from the pollen grains present in the honey, which improves greatly with age, as the pollen grains settle to the bottom of the container.

**BLACKBERRY (Rubus).**

The blackberries, dewberries and raspberries are closely related plants, all of which are good honey sources. The blackberry is especially well known in the Southeastern States, where it thrives in fence corners and moist woodland borders. In north Georgia it is one of the principal sources of surplus honey. Farther north the nectar yield is apparently not as good, and in some localities the bees apparently do not get much honey from this source. Lovell states that in New England there is very little nectar available from either wild or cultivated blackberries. Richter states that the Himalaya variety of blackberry yields some honey in Yuba County, California. John W. Cash reports an average of 25 pounds per

colony of surplus at Bogart, Georgia. The honey is amber, very thick, and does not granulate.

There are parts of California where the dewberry is reported to be very important and to yield surplus. The honey is of good flavor and a light amber color.

The raspberry is the most important of the group. (See Raspberry).

Fig. 22. Mangrove bloom.

**BLACK BINDWEED, see Bindweed.**
**BLACK GUM, see Tupelo.**

**BLACK HAW (Viburnum prunifolium).**

The black haw belongs to a group containing several valuable honey plants. It occurs from Connecticut to Michigan and south to Georgia, Albama, Mississippi, Louisiana and Texas. (In the South it is given a varietal name.) It is a shrub or small tree, blooming in the North in May and June and in the South in April and May. Its principal value lies in

stimulating early brood-rearing, since in few localities it is of sufficient abundance to be important as a source of surplus.

Scholl lists it as yielding well, early, in Texas.

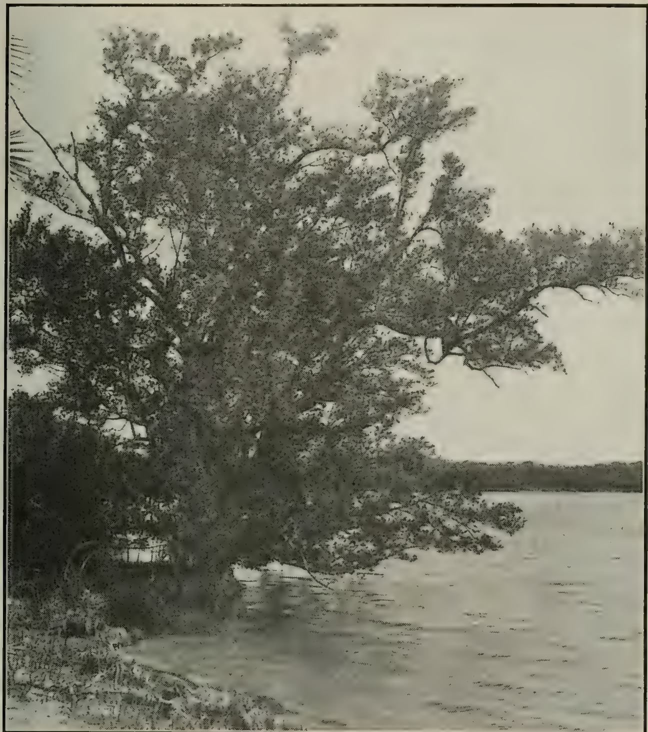


Fig. 23. The black mangrove tree.

**BLACK LOCUST, see Locust.**

**BLACK MEDIC (Medicago lupulina).**

Black medic is a widely distributed plant in California, but not very common. It blooms from April to June. It is the source of some nectar, but is probably not of much importance, except possibly in a few limited localities.

**BLACK MANGROVE (Avicennia nitida).**

Black mangrove **(Avicennia nitida)** is also known as blackwood, or

blacktree. It is an evergreen tree, growing along the seashores of the coast of Florida. It is said also to occur to some extent along the gulf coast to Texas and throughout the coasts of Tropical America. It varies from a bushy shrub to a tall tree 60 or more feet in height in tropical regions. The wood is coarse-grained, hard and very durable in contact with the soil. The tree is to be found only in the vicinity of salt water.

The honey from the mangrove is light in color, mild in flavor, and is generally regarded as of first quality. According to E. G. Baldwin it was the heaviest yielder of nectar known in the south prior to the big freeze of 1895. In one year he reports Harry Mitchell, of Hawk's Park, as having secured an average of 380 pounds per colony from mangrove alone. Following the freeze it failed to yield nectar in surplus quantity for about fifteen years, and reports since that time have indicated that it is not up to its former importance.

The blooming period opens about the middle of June and usually includes the entire month of July. The flow usually lasts from six to eight weeks.

**BLACK TREE, see Black Mangrove.**
**BLACKWOOD, see Black Mangrove.**

**BLOODROOT (Sanguinaria canadensis).**

The bloodroot is a common wild flower in the moist woods of all our Northern States. It blooms early in April, and is eagerly sought by the bees for pollen. The plant is shown at Fig. 24.

Fig. 24. The bloodroot is a source of early pollen.

**BLUEBERRY (Vaccinium).**

There are at least four species of blueberry which give surplus honey in localities where they are abundant. According to Sladen, the dwarf or early sweet blueberry, **(Vaccinium pennsylvanicum),** and the sour-top or velvet-leaf blueberry **(Vaccinium canadense),** often give surplus in northern Ontario, northern Quebec and eastern Manitoba.

Blueberry honey is frequently reported from New England. W. J. Sheppard reports that **Vaccinium ovalifolium** is of importance in British Columbia.

There are several other species in the Northeastern States that probably yield some nectar. Sladen reports blueberry as important in Nova Scotia.

According to Lovell **Vaccinium corymbosum,** the high bush blueberry, is important in southeastern Massachusetts, Rhode Island and Connecticut, in some localities beekeepers being principally dependent upon it. The flow comes late in May or early June and lasts for about ten days. Strong colonies store as high as 50 to 90 pounds of surplus from it. He reports **V. pennsylvanicum,** the low bush blueberry already mentioned, as common throughout northern New England, in pastures and on rocky land. It is important in the blueberry barrens of Maine. The honey is amber and of good flavor.

**BLUEBONNET, see Lupine.**
**BLUEBOTTLE, see Centaurea.**

**BLUE CURLS (Trichostema lanceolatum).**

Blue curls is a plant known by a great variety of names in California. It is known as vinegar weed, camphor weed, turpentine weed, flea weed, bastard-pennyroyal, etc. It abounds over a large portion of California. According to Jepson, the range is throughout the Coast Ranges, Sierra Nevada foothills and southern California. The Western Honeybee lists it as the best fall honey plant in California. Both foliage and flowers have a pungent, penetrating odor. The plant is found mostly in stubble fields, where it appears after grain harvest. From the same source we quote as follows:

> "Under favorable atmospheric conditions it yields abundantly of a very white honey, that granulates quickly and with a fine grain. Sometimes it granulates before the bees have time to seal the cells. One peculiarity of this plant is that it continues to yield honey for several hours after falling to the ground. The quality of the honey is good."—Western Honeybee. October, 1914.
>
> "It is often claimed that rain will end the honeyflow from blue curls. I find by several seasons' observation that this is an error. If a rain is followed by favorable atmospheric conditions—warmth and humidity—the nectar secretion is increased instead of diminished."—Western Honeybee, November, 1916..

The flow from blue curls begins in August and continues till frost. Richter reports that very large yields are sometimes secured from this source, tons of honey sometimes being stored in the vicinity of Fresno. A

report of an average of 80 pounds per colony from this source reached the author when visiting at Visalia.

Fig. 25. The blue curl.

**BLUE GUM, see Eucalyptus.**
**BLUE LUPINE, see Lupine.**
**BLUET, see Centaurea.**

**BLUE THISTLE (Eryngium articulatum).**

The blue thistle is listed by Richter as the source of a dark honey of good flavor in California. He reports it from the Suisun Marshes, along the Consumnes River and the Alvarado Marshes, blooming from August to October.

**BLUEVINE (Gonolobus laevis).**

This plant is also known as devil's shoestring, climbing milkweed, sand vine, wild sweet potato vine and anglepod. It is a vine of luxuriant

Fig. 26. Seed pods and leaves of the bluevine, or sandvine.

growth, common on low lands from Virginia and Tennessee westward to Missouri and south to Texas. It is common in Southern Ohio, Indiana and Illinois, where it is a persistent and troublesome weed. It is especially troublesome in the corn fields, where it may be found climbing the stalks. A single vine will run for many feet on fence wires or other support. It blooms freely through July and August, and is the source of large quantities of surplus honey of good quality. The honey is light in color, mild in flavor and does not granulate readily. S. H. Burton, of Washington, Indiana, reports a yield of 60 pounds per colony in three weeks and an average of as high as 80 pounds per colony has been reported from

Southern Indiana. From Missouri come similar reports, W. L. Wiley, of Brunswick, reporting as much as 100 pounds surplus from strong colonies.

The plant may be readily recognized by the abundant clusters of small, white flowers, which are followed by seed pods similar to those of the milkweed. When the pods are dry they split open and the seeds are widely scattered by means of their cottony parachutes.

The honey is clear, heavy-bodied and of excellent flavor. The plant

Fig. 27. Boneset yields in late summer and fall.

grows chiefly in cornfields in river bottom land and is perennial. It blooms before smartweed, but the smartweed honey is usually mixed with it, as it comes in later.

**BLUEWEED or VIPER'S BUGLOSS (Echium vulgare).**

The blueweed, or viper's bugloss, is a weed naturalized from Europe. It is common in the meadows and roadsides of the Eastern States. It has showy purple or blue flowers and grows about two feet high. June is the flowering period. Sladen lists it as an important source of nectar in Southern Ontario. Probably not sufficiently abundant to be very important in many places.

This plant was introduced into Australia from Europe by a settler named Patterson, and has become widely spread there, where it is known as "Patterson's curse." Rayment states that it yields honey, but hardly sufficient to store much in the supers. (Money in Bees in Australasia).

**BONESET (Eupatorium).**

There are 475 species of **Eupatorium** known, many of them found in Tropical America. Some are found in Europe, Asia and South America, so that the plants have a wide range. Forty-five or more species are common to North America. Whether nearly all yield nectar, we have no records to prove. Fig 27 shows **Eupatorium ageratoides,** a species common from New England south to Tennessee and Georgia. According to J. M. Buchanan, it is common over the State of Tennessee, but only yields honey in the northern part. He reports the honey to be a light amber, of strong flavor. The yield comes in August and September. Fig. 28 shows the white snakeroot **(E. urticaefolium),** a species common to the woodlands of the Middle West. Although the bees visit this species freely, from September until killed by frost, usually in October, the honey yield is probably rather small.

The Joe-Pye weed or turnip weed **(E. purpureum),** is frequently reported as yielding honey, and it is one of the most widely distributed species. It is found from New Brunswick to Manitoba and south to Colorado, Texas and Florida.

The boneset of commerce is made from thoroughwort **(E. perfoliatum),** which is one of the best for honey in the Northern States and Canada.

All the bonesets are autumn bloomers, and the honey is usually mixed with that of heartsease, asters, goldenrod, Spanish needles and other plants blooming at the same period. Several years ago Professor Beal made the statement, in the American Bee Journal, that there were twenty species or more valuable to the bees. The wide distribution of the group, together with the regularity of its yield, make it one of special importance to the beekeeper, although the amount of surplus gathered from boneset is not often as large as that of many other well-known plants.

Some species of boneset are to be found in almost any kind of situation. While white snakeroot grows in shady woodlands, other kinds de-

Fig. 28. White snakeroot.

light in open, sunny situations, along roadsides and in pastures or waste places. Some do best on high lands, while others thrive in low, wet land. In places in the Mississippi River bottoms in Illinois, boneset, together with heartsease and Spanish needle, cover acres of the richest land like a waving grain field.

An Illinois beekeeper reports **Eupatorium serotinum** to be one of the best honey plants he knows.

**BOOTJACK, see Spanish Needle.**

**BORAGE (Borago officinalis).**

Borage is a European plant which is cultivated for honey and as an ornamental. Its blue flowers are very attractive to the bees. The following quotations indicate its value to the beekeeper:

"The period of blooming is from June 20 to cold weather. Where there are no plants for bees to work upon, borage does very well; but

when white clover and basswood are in bloom, bees will forsake the borage for them. As cold weather begins to come, they swarm to the borage. It is a good honey plant, when there are no plants of greater importance in bloom."—Fisk Bangs, American Bee Journal, page 84, 1878.

"In Practicher Wegweiser, page 280, Herr Willhelm says that in response to the general cry, 'Sow borage,' he has been sowing it for years and now has it in abundance. How the bees do hum upon it! But, alas! now that he has it in such abundance that it shows its character in the surplus honey, he finds it such as no customer wants, and says it is as black as a certain 'gentleman' with whom beekeepers do not generally care to have dealings. The task of getting it now rooted out is a difficult one."—American Bee Journal, page 103. 1908.

**BOX ELDER (Negundo aceroides or Acer negundo).**

The box elder, or ash-leaved maple, is a near relative of the maples,

Fig. 29. Blossoms of the box elder.

and is sometimes included with them. Fig. 29 shows the staminate blossoms of box elder. As in the willows, the stamens are borne on one plant and the pistils on another.

The box elder is found from New England and Southern Canada west

to Dakota and southward. It is also common in California. Apparently its range does not extend as far southward as other maples. It is very commonly planted for windbreaks and shade in the prairie States of the Central West. Some honey is yielded by the blossoms, and honeydew is often secreted by aphis feeding on the leaves. While not generally regarded as especially valuable, its season is such that its addition to honey-producing flora is important. The blooms come very soon after soft maple, in April.

**BOSTON IVY (Ampelopsis veitchii).**

The Boston ivy is a well-known climbing vine, clinging to the walls of brick and stone buildings in all our northern cities. The flowers are very attractive to the bees in midsummer and the bees store some honey from this source. The quality is rather inferior.

**BRASSICA, see Mustard.**

**BRAZIL or LOGWOOD (Condalia obovata).**

Brazil or logwood is a spiny shrub, or small tree, common to Western Texas. It occurs in the lower Rio Grande and is reported as a source of honey at Brownsville. There it is smaller than farther north and west. In places it forms very dense thickets, called "chaparral." Beekeepers report it as important in the fall, yielding a dark honey. The honey is said to be of fine flavor, despite its dark color. The flow at Beeville is reported as being very rapid. At Goliad, W. C. Collier reports Brazil as the best all-round honey plant. He states that it blooms sometimes in spring and sometimes in fall. Again, it sometimes blooms several times, and yields at irregular periods. At Crystal City, the honey from Brazil is reported as rank flavored, exactly opposite from reports of quality in eastern parts of its range.

**BRITISH COLUMBIA—Honey Plants of.**

Indigenous honey-yielding flowers, Kootenays, B. C.:

Willows—Glauceus or pussy willow **(Salix discolor).** River bank willow **(Salix longifolia).** Flower in March and April and probably yield more pollen than honey.

Dandelion **(Taraxicum officinale).** Flowers in April and May.

Bearberry—Kinnikinnik **Arctostaphylos Uva ursi).**

Blueberry **(Vaccinium ovalifolium).**

Huckleberry **(Gaylussacia resinosa).**

Choke cherry **(Prunus demissa).**

Bird or pin cherry **(Prunus pennsylvanica).**

Bearberry—Kinnikinnik **(Arctostaphylos Uva ursi).**

Wild raspberry **(Rubus).** Flowers in June.

Dogbane—Milkweed **(Apocynum androsaemifolium).** Spreading dogbane.

Snowberry **(Symphoricarpos racemosus).**

Wolfberry **(Symphoricarpos occidentalis).**

Canada thistle **(Cirsium arvense).** Flowers in June and July.

Willow herb or fireweed **(Epilobium angustifolium).**

Goldenrod **(Soladago canadense).** Flowers in July and August.

—W. J. Sheppard. American Bee Journal, Nov., 1917.

**BROOMWEED (Gutierrezia texana).**

Broomweed is a common fall plant over a large portion of Texas, on the prairies. According to Scholl it yields well in September and October. The honey is dark and strong and valued mostly for winter stores. In the November 1, 1906, issue of American Bee Journal he writes as follows concerning this plant:

"Broomweed is still in bloom, the pastures being one sheet of golden yellow. Cold nights and cool, windy days have interfered with the bees somewhat, but there are yet many warm days when the bees are very busy. Some of my bees have stored a good deal of surplus from this plant, for this time of the year—about 20 pounds per colony. The honey is a golden yellow and has a somewhat strong taste, a little bitter, and hence is not a suitable honey for market."

**BUCKBRUSH, see Indian Currant, also Snowberry and Dogbane.**

**BUCKEYE (Aesculus).**

The buckeye or horse chestnut is widely distributed and well known because of the poisonous properties of the peculiar nut-like fruit, everywhere called buckeye. There are several species, with minor differences. The photograph is of the blossoms of the Ohio buckeye **(Aesculus glabra).** This species occurs from New England west to Iowa, Kansas and Oklahoma and south to Georgia, Alabama and east Texas. There is a species common on the Pacific Coast known as the California buckeye **(Aesculus californica).** This species is reported as yielding considerable honey in some localities in California, and some beekeepers think it is poisonous to the bees.

The buckeye is widely mentioned as a honey plant, though there are few localities where it is sufficiently abundant to be important as a source of surplus.

Fig. 30. Blossoms and leaves of buckeye or horse-chestnut.

**BUCKTHORN (Rhamnus).**

The common buckthorn **(Rhamnus cathartica)** is a hedge plant introduced from Europe and commonly cultivated. It has become naturalized in some localities.

In California there are three species reported as important sources of honey. The coffee berry **(Rhamnus californica)** is an evergreen shrub 4 to 6 feet high, with olive-like leaves, common to the Coast Ranges and the Sierra Nevada Mountains and southward. Called also pigeon berry.

Richter reports this species as yielding an amber honey of very heavy body in the foothills of the Sierra Nevada Mountains and also in San Diego County. Honey of good flavor, slightly cathartic.

The redberry **(Rhamnus crocea)** occurs in the Napa Range and southward near the coast to southern California, according to Jepson. It is tree-like, with a distinct trunk, sometimes several stems clustered, 5 to 12 feet high. Richter reports it of special value for early breeding.

The Cascara Sagrada or Chittam **(Rhamnus purshiana)** occurs in northern California, where it is reported as an important source of amber honey. In the timbered portions of western Oregon, Washington and British Columbia, it is reported as one of the chief sources of honey. The honey is amber, with a delightful aroma. When fully ripened it is too thick to extract readily, and there is much breakage of combs. The flow begins in May and the honey is usually mixed with that from other plants. The blooming period lasts about a month.

> "We get more honey from cascara than from any other one plant in this vicinity. It is so dark as a comb honey that it is a poor seller to those who go on looks alone. We prefer it on our table to any other honey. I have customers who will take no other. It is not purgative, but one of the best remedies for chronic constipation known. I have never known any of the pure article to granulate under any conditions."—A. D. Herold, Gleanings, Jan. 1, 1910.

**BUCKWHEAT (Fagopyrum esculentum).**

Buckwheat is a native to Asia, which was early introduced into America from Europe by the colonists. It has become an important field crop, and buckwheat flour is a staple in American markets. It is often sowed as a catch crop on lands that have not been ready for early sown crops, or where the first sowed crop failed to secure a stand. It requires a short season in which to reach maturity and is usually sown in June or July. It needs a cool, moist climate for best results and often fails to yield a satisfactory crop of grain or to secrete nectar in the hot and dry atmosphere of Iowa and Nebraska.

It is well suited to sandy or other light soils and is grown extensively in the sandy lands of northern Michigan.

Buckwheat is an important source of surplus honey in the region of the Great Lakes. Ontario, New York, Pennsylvania, Ohio and Michigan are the States from which come the great crops of buckwheat honey. Although the crop is often grown further west, the amount of honey secured is very disappointing in most cases. The author corresponded with a number of prominent Iowa beekeepers, and found only one who had

secured surplus honey from buckwheat to any extent, and his was mixed with other sources to such an extent as to have a very different color and flavor from that which is secured unmixed.

It was given a trial at the Texas Agricultural College for a period of three years. It failed to meet expectations as a honey plant on account of the hot and dry weather which prevails there during most summers. It was reported as blooming profusely, but not yielding nectar.

In New York it is regarded as one of the best honey plants. The late E. W. Alexander, writing in Gleanings, stated that he had kept 200 colonies in a location with scarcely 100 acres of buckwheat within four miles, yet

Fig. 31. Buckwheat field in bloom.

had harvested 15 to 20 pounds of section honey from buckwheat per colony. He stated that it yielded best with cool nights followed by a clear sky and a hot sun, with little or no wind. Under such conditions it secreted nectar freely from about 9 a. m. to 2 p. m. No bees would be seen on it earlier or later in the day. On one occasion, when there were 1,500 acres of buckwheat within reach of his bees, they were gathering fast at the beginning of the August harvest. A thunder storm caused the temperature to drop 21 degrees in less than half an hour. The weather remained cloudy and windy, with a temperature of about 65 degrees, for eleven days. During that time the bees gathered no honey, and destroyed much of their brood.—Gleanings, March 15, 1907.

The Ontario Association's Crop Report Committee reported an average per colony production of 23 pounds from the more than ten thousand colonies belonging to its members for two years in succession. A writer

in the American Bee Journal asserts that in a favorable season an acre of buckwheat will yield 25 pounds of honey daily, and that a strong colony within half a mile of a field, will store six to eight pounds per day. Alexander kept as high as 700 colonies in one yard, at his home near Delanson, New York, and secured satisfactory crops, though, of course, there was a large acreage within reach.

### Quality of the Honey

Honey from buckwheat is very dark and has a strong flavor. People who are accustomed to light and mild honey of the clover type seldom like it. On the other hand, residents of the west, who were raised in the buckwheat country of eastern New York, regard the clover honey as insipid and not to be compared to the dark honey with which they were familiar in childhood. Buckwheat honey has a peculiar flavor, slightly nauseating to one unaccustomed to it.

During a heavy flow from this source there is a strong odor present in the apiary which can be detected for some distance. J. L. Byer, in the American Bee Journal, tells of a case where a farmer and his wife spent some time looking for dead chickens in the vicinity of the hives, mistaking the odor of the new nectar, which the bees were bringing in, for that of a dead fowl. (Page 306, October, 1908.)

Buckwheat varies somewhat in density, acording to weather conditions at the time it is gathered. When fully ripened on the hives it is sometimes so thick as to be hard to extract. Some beekeepers report honey from this source which weighs as much as fourteen pounds to the gallon. On the other hand, there are numerous reports of very thin honey, probably because of being extracted before fully ripened.

Buckwheat honey is used largely in France to make a gingerbread "pain d'epices," in which the peculiar odor and flavor of the buckwheat is very noticeable and is much liked by those who are accustomed to it.

**BUCKWHEAT TREE, see Ti-Ti.**
**BUFFALO BEAN, see Loco Weed.**
**BULL BAY, see Magnolia.**
**BUM-WOOD, see Poisonwood.**

**BURDOCK (Arctium lappa).**

The burdock is a coarse, disagreeable weed, introduced from Europe and Asia. It is now common over the United States. The burrs fasten themselves to the clothing or to passing animals, and in this manner the seeds are spread. It is a biennial, common in barn lots and waste places.

The burdock is one of the many plants on which the bees work to some extent that never count for very much in the total production of the hive. The sources of surplus are comparatively few in number, but there are hundreds of plants from which the bees get a taste of honey or pollen. The presence or absence of these minor plants makes a great difference in the value of a locality for honey production. If there are enough of them to keep the bees busy, and sustain the colony between

flows when the good yield comes, the bees are in the best possible condition to take advantage of the opportunity.

Fig. 32. Burdock.

**BUR CLOVER (Medicago denticulata).** Wild.

Bur clover is a relative of alfalfa which is very common over much of California. The burs are produced abundantly and the plant is prized as a stock forage. The plant, although spreading like a weed, is valuable both to live stock and for bees. The principal blooming period is from March till June, though it blooms to some extent at all seasons.

Richter lists it as especially valuable to stimulate early breeding, but states that surplus is occasionally harvested from this source and that it is fully equal to filaree or pin clover as a honey plant.

**BUR-MARIGOLD, see Spanish Needle.**

**BUSH HONEYSUCKLE (Diervilla Lonicera).**

The bush honeysuckle is a common bush shrub in the northeastern States. It is to be found from Newfoundland south to North Carolina and west to Minnesota. It is reported as common in New England and Ontario. In Northern Minnesota, where it is abundant, beekeepers report

that the bees work it eagerly when the weather will permit. The flowers are not showy, but the profuse bloom is rich in nectar. The blooming period begins in June and, in some places, continues as late as August.

**BRUNNICHIA.**

The tendril-bearing smartweed, or ladies' ear drops **(Brunnichia cirrhosa)** is a perennial climbing vine, common to the southeastern States. It ranges from southern Illinois and Arkansas to South Carolina and Florida. An Arkansas beekeeper reports that the plant is abundant in his locality and covered with bees.

H. B. Parks reports it grows on the low lands of Southeast Texas, where it blooms from March till August and yields some surplus.

**BUFFALO CURRANT (Ribes aureum).**

The yellow flowers of the buffalo currant are very fragrant and apparently contain much nectar. The writer has often noticed the bees working on the blossoms, but since the corolla tubes are half an inch or more in length he supposed they were getting only pollen. A close examination showed that the bees were unmistakably getting nectar from this source and that the tubes had been slit entirely down one side by some unknown agency. Whether this is a common occurrence the author cannot say.

Fig. 33. Blossoms of the button-bush.

**BUTTER WEED or GROUNDSEL (Senecio).**

The groundsels are herbs with alternate leaves and mostly yellow flowers, common to the northeastern States. The bees are reported as working upon them freely, but they are probably of minor importance.

**BUTTON-BUSH (Cephalanthus occidentalis).**

The button-bush, also called button willow, is a bushy shrub growing in marshy places, stagnant shallow water, and along streams, from New England to Texas and west to California. This shrub, or in places a small tree, has a very wide range and is found in most of the States where honey production is important. Bulletin No. 102 of the Texas Agricultural College, reports it as common throughout Texas, and the bulletin relating to honey plants of California (217 Experiment Station), records it as a good honey plant in California. It is listed in the catalog of plants of nearly every State and of Canada, which the author has consulted. It is also said to occur in Asia, and possibly Africa.

Our readers who live in the vicinity of wet lands are likely to find specimens near at hand. In a few sections it is sufficiently abundant to be an important addition to the midsummer flora. It is reported as more particularly valuable in the overflowed lands along the Mississippi River. The bees seek it eagerly when in bloom, and in places where it is plentiful it is regarded as of considerable value as a honey plant.

The honey is light in color and mild in flavor, according to published reports. Fig. 33 shows a near view of the flowers, which are crowded together in dense heads, giving them the appearance of cotton balls.

The shrub is very bushy, with an abundant foliage. It is reported as reaching a height of 40 feet in California. In Alabama it is recorded as a shrub of from 6 to 15 feet in height, which is more like its appearance in Iowa, according to the author's observation. Here it is rather a small bush, not much higher than a man's head, and as far across, with many branches from the ground.

The blooming period is July and August, according to locality, a season when additions to the honey-producing flora are most welcome.

**BUTTON-WEED (Diodia teres).**

The button-weed occurs on sandy lands from New England to Florida and west to Kansas and Texas. Scholl lists it as yielding honey well during drought in Texas, but not as a source of surplus.

**BUTTON WILLOW, see Button Bush.**

# C

**CABBAGE (Brassica oleracea).**

Cabbage belongs to a group of valuable honey plants, including mustard, turnip, etc. In the seed belt of California, where grown for seed on a large scale, cabbage is valuable. The late J. S. Harbison said of it:

> "Cabbage blossoms afford a considerable amount of honey of a fine quality and flavor."—Beekeeper's Directory.

**CACTUS, see Prickly Pear.**
**CALICO BUSH, see Laurel.**
**CALIFORNIA HOLLY, see Christmas Berry.**

**CALIFORNIA—Honey Sources of.**

Honey plants yielding a surplus during an average season:
Yucca **(Hesperoyucca whipplei).**
Willow **(Salix sp.)**
Wild buckwheat **(Eriogonum fasciculatum).**
**Berberis pinnata.**
Black mustard **(Brassica nigra).**
English mustard **(Brassica sp.)**
Rocky Mountain honey plant **(Cleome integrifolia).**
Jackass clover **(Wislizenia refracta).**
Christmas berry **(Heteromeles arbutifolia).**
Pear **(Pyrus communis).**
Apple **(Pyrus malus).**
Wild alfalfa **(Lotus glaber).**
Bur clover **(Medicago denticulata).**
Alfalfa **(Medicago sativa) .**
White sweet clover **(Melilotus alba).**
Yellow sweet clover **(Melilotus officinalis).**
Lima bean **(Phaseolus lunatus).**
Alfilerilla **(Erodium cicutarium).**
White stem filaree **(Erodium moschatum).**
Orange **(Citrus aurantium).**
Tree of heaven **(Ailanthus glandulosa).**
Poison oak **(Rhus diversiloba).**
(Laurel) Sumac **(Rhus laurina).**
Pepper tree **(Schinus molle).**
California buckeye **(Aesculus californica).**
Coffee berry **(Rhamnus californica).**
Cascara sagrada **(Rhamnus purshiana).**
Wild hollyhock **(Sidalcea malvaeflora).**
Prickly pear **(Opuntia lindheimeri occidentalis).**
Lemon scented gum **(Eucalyptus citriodora).**
White stringy-bark **(Eucalyptus eugenioides).**
Blue Gum **(Eucalyptus globulus).**

Red gum **(Eucalyptus rostrata).**
Manna gum **(Eucalyptus viminalis).**
Blue thistle **(Cryngium articulatum).**
Manzanita **(Arctostaphylos).**
Yerba santa **(Eriodictyon trichocalix).**
Caterpillar phacelia **(Phacelia hispida).**
Valley vervenia **(Phacelia tenacetifolia).**
Carpet grass **(Lippia nodiflora).**
Horehound **(Marrubium vulgare).**
Peppermint **(Mentha spicata).**
White sage **(Salvia apiana).**
Thistle sage **(Salvia carduacea).**
Annual sage **(Salvia columbariae).**
Purple sage **(Salvia leucophylla).**
Black sage **(Salvia mellifera).**
Creeping sage **(Salvia sonomensis).**
Blue curls **(Trichostema lanceolatum).**
Button willow **(Cephalanthus occidentalis).**
Napa thistle **(Centaurea melitensis).**
Spike weed **(Centromadia pungens).**
Bull thistle **(Cirsium lanceolatum).**
Common sunflower **(Helianthus annuus).**
Coast tarweed **(Hemizonia corymbosa).**
Tarweed **(Hemizonia fasciculata).**
Yellow tarweed **(Hemizonia virgata).**
"Yellow Tops" **(Hemizonia).**
Goldenrod **(Solidago occidentalis).**
Rabbit brush (white) **(Chrysothamnus nauseosus hypolluca).**

Cultivated plants that would rank with the above had they a wider distribution:

Common century plant **(Agave americana).**
White clover **(Trifolium repens).**
American linden **(Tilia americana).**
Tamarisk **(Tamaris, Eucalyptus calophylla).**
Yate tree **(Eucalyptus cornuta).**
Sugar gum **(Eucalyptus corynocalyx).**
Cider gum **(Eucalyptus Gunnii, Eucalyptus Lehmannii).**
White ironbark **(Eucalyptus leucoxylon).**
Spotted gum **(Eucalyptus maculata).**
Honey scented gum **(Eucalyptus ficifolia).**
Red boxtree **(Eucalyptus polyanthemos).**
Red mahogany gum **(Eucalyptus resinifera).**
Swamp mahogany gum **(Eucalyptus robusta).**
Broad leaved ironbark **(Eucalyptus siderophloia).**
Victoria ironbark **(Eucalyptus sideroxylon).**
Apple scented gum **(Eucalyptus Stuartiana).**
Forest gray gum **(Eucalyptus tereticornia).**

Honey plants occasionally yielding a surplus:

Asparagus **(Asparagus officinalis).**
Live oak **(Quercus agrifolia).**
Blue oak **(Quercus douglassii).**
Valley oak **(Quercus lobata).**
Mistletoe **(Phoradendron).**
Common mustard **(Brassica campestris).**
Wild radish **(Raphanus sativus, Escallonia montevidensis).**
Wild currant **(Ribes sanguineum).**
Greasewood **(Adenostema fasciculatum).**
Castor oil plant **(Ricinus communis).**
Islay or holly leaved cherry **(Cerasus illicifolia).**
Bitter almond **(Prunus amygdalus).**
Apricot **(Prunus amygdalus).**
Apricot **(Prunus armeniaca).**
Cherry **(Prunus cerasus).**
Plum and prune **(Prunus domestica).**
Peach **(Prunus persica).**
Raspberry **(Rubus strigosus).**
Cultivated blackberry **(Rubus villosus).**
Himalayan berry **(Rubus villosus var).**
Common wild blackberry **(Rubus vitifolius).**
Black wattle **(Acacia decurrens mollis).**
Golden wattle **(Acacia pycnantha).**
Rattleweed **(Astragalus).**
Yellow sweet clover **(Melilotus indica).**
Locust **(Robinia pseudo-acacia).**
Sour clover **(Trifolium fucatum).**
Alsike **(Trifolium hybridum).**
Gorse **(Ulex europaeus).**
Mandarin **(Citrus nobilis, Croton californicus).**
Turkey mullein **(Eremocarpus setigerus, Ceanothus cuneatus).**
Wild lilac **(Ceanothus, Rhamnus corcea).**
Grape **(Vitis vinifera).**
Cotton **(Gossypium herbaceum, Godetia bottae).**
California waterweed **(Jussiaea californica).**
Sweet fennel **(Foeniculum vulgare).**
Madrona **(Arbutus menziesii).**
Oregon ash **(Fraxinus oregona).**
Olive **(Olea europaea).**
Morning glory **(Convolvulus arvensis, Gilia chamissonis).**
Hill vervenia **(Phacelia distans, Phacelia ramosissima).**
Heliotrope **(Heliotropium).**
Lawn plant **(Lippia repens).**
Wild verbena **(Verbena prostrata).**
Yerba Buena **(Micromeria chamissonis).**
Hedge nettle **(Stachys bullata).**

California figwort **(Scrophularia californica).**
Simpson's honey plant **(Scrophularia vernalis).**
Watermelon **(Citrullus vulgaris).**
Cantaloupe **(Cucumis mello).**
Cucumber **(Cucumis sativus).**
Winter squash **(Cucurbita moschata).**
Pumpkin **(Cucurbita pepo).**
Globe artichoke **(Cynara Scolymus).**
Jerusalem artichoke **(Helianthus tuberosus).**
Mayweed **(Anthemis cotula).**
Beggar ticks **(Bidens frondosa).**
Spanish needle **(Bidens pilosa, Coreopsis gigantea).**

Cultivated plants that would rank with the above had they a wider distribution:

Mignonette **(Reseda odorata).**
White tree clover **(Cystisus proliferus, Melilotus bicolor).**
Poinsettia **(Euphorbia pulcherrima).**

Honey plants not known to yield a surplus:

Corn **(Zea mays).**
Tanbark oak **(Quercus densiflora).**
Virgin's bower **(Clematis ligusticifolia, Clematis).**
California laurel **(Umbellularia californica).**
California poppy **(Eschscholtzia californica).**
Cream cups **(Platystemon californicus).**
Canyon gooseberry **(Ribes menziesii).**
(Western) chokecherry **(Cerasus demissa).**
Rose **(Rosa californica).**
Wild sweet pea **(Lathyrus splendens).**
Lupin **(Lupinus affinis).**
Nonesuch **(Medicago lupulina) .**
Red clover **(Trifolium pratense).**
Spring vetch **(Vicia sativa).**
Maple **(Acer negundo).**
Virginia creeper **(Ampelopsis quinquefolia).**
California wild grape **(Vitis californica).**
Small flowered mallow **(Malva parviflora).**
White mallow **(Malva sylvestris, Helianthemum scoparium).**
Milkweed **(Asclepias mexicana).**
Milkweed **(Asclepias speciosa).**
Dodder **(Cuscuta).**
Common heliotrope **(Heliotropium curassavicum).**
**Tournefortia heliotropoides.**
Tule mint **(Mentha canadensis).**
Pennyroyal **(Monardella lanceolata).**
Loving sage **(Salvia amabilis).**
Winter savory **(Satureia montana.**

**Stachys ajugoides.**

**Stachys albens.**

**Veronica andersonii.**

Common plantain **(Plantego major).**

Wild honeysuckle **(Lonicera).**

Blue elderberry **(Sambucus glauca).**

Cornflower **(Centaurea cyanus), Encelia californica, Eriophyllum confertiflorum, Heterotheca grandiflora, Malacothris saxatilis.**

Common sow thistle **(Sonchus oleraceus, Sonchus maruanthus).**

—M. C. Richter, Bulletin 217, Agricultural Experiment Station, Cal.

**CALIFORNIA POPPY,** **see Poppy.**

**CAMPANILLA (Ipomoea).**

The campanillas, or Christmas bells, are plants similar to our American morning-glory, which are common to Cuba and adjacent countries. The vines are perennial and grow to considerable size, covering wayside fences, trees, etc. The name Christmas bells, applied to white bellflower, comes

Fig. 35. Catalpa blossoms.

from the fact that the height of the blooming period is reached near the holiday season. There are two species, known as white campanilla **(Ipomoea sidaefolia),** and the pink bellflower **(Ipomoea triloba).** The latter blooms a month or two before the white variety.

The honey, according to Root's A B C, is equal to alfalfa or sage in color and flavor, the comb built during a campanilla flow being pearly white and the wax, when melted, as white as tallow.

**CAMPHOR WEED, see Blue Curls.**

**CANADA THISTLE (Carduus arvensis).**

The Canada thistle is a most troublesome weed, naturalized from Europe and widely spread through Eastern America. It is a perennial plant, growing from one to two feet high. The roots creep extensively, thus gradually spreading the plant to surrounding areas. It is very persistent and difficult to eradicate. It is common in fields, pastures and along roadsides.

It is the source of a light honey of good quality. It is most frequently reported as a source of surplus in Ontario and the Eastern States.

**CANADIAN HEMP, see Dogbane.**

**CARPET GRASS (Lippia).**

The carpet grass of California **(Lippia repens)** is a native of Chili which has been introduced on the Pacific Coast and widely cultivated as a lawn plant. It is known as lawn plant, carpet grass and lippia. It is much sought by the bees and is the source of some honey, a surplus of two cases per colony being not unusual, according to C. D. Stuart. The honey, he states, is light amber, heavy body, and similar in quality to alfalfa. The plant is of trailing habit, spreading by rooting of runners like strawberries. Fig. 34.

Fig. 34. Carpet grass or Lippia.

**Lippia nodiflora,** mat grass or fog fruit, is native to California, and, according to Richter, is the principal source of surplus honey in the vicinity of Sacramento. Three-fourths of the surplus honey from Sutter County he reports as from this source. There it begins to bloom in May and lasts till frost. According to Jepson, the plant is esteemed as a covering for levees, to resist erosion. It is especially valuable on overflowed lands after the water recedes. The honey is said to be light in color, mild in flavor, and to granulate readily.

**CARROT (Daucus carota).**

The carrot is a well-known garden vegetable which came from

Europe and is everywhere cultivated in gardens. It has escaped and become naturalized over a wide scope of country. It yields some honey, and where grown on a large scale for seed or for the roots, it is valuable for the bees.

We quote Richter as follows:

> "Honey white, with a characteristic flavor, and granulating within a few months after extraction. A most excellent yielder in the Sacramento Valley, where it is considered to surpass the onion as a honey plant."—Honey Plants of California.

**CASCARA SAGRADA, see Buckthorn.**
**CASSIA, see Partridge Pea.**

**CASTOR BEAN (Ricinus communis).**

The castor bean, or castor oil plant, is often cultivated for the oil con-

Fig. 36. Catnip.

tents of the beans. Large areas were planted during the late war, especially in Texas. The plant has escaped from cultivation and become naturalized in the Southeastern States. It is generally planted for ornament over a large scope of country. It is reported as very attractive to the bees and of some value for honey, where sufficiently abundant. Scholl lists it in the Texas bulletin as yielding well in favorable seasons. Richter lists it also for California.

**CASTOR OIL PLANT, see Castor Bean.**

**CATALPA (Catalpa speciosa).**

The catalpa tree produces a great profusion of bloom. The blossoms are so large that a bee can readily crawl right into the heart of the flower.

The testimony of competent observers gives an unqualified indorsement of the catalpa as a nectar producer, though there is slight mention of it in our literature. The fact that large areas of these trees are being planted for timber, in many places, makes them of special interest to the beekeeper. The catalpa, or Indian bean **(Catalpa speciosa)** is a native of the woodlands of southern Indiana and Tennessee, west to Arkansas. This form, known as the hardy catalpa, is also widely planted in Iowa, Illinois, Kansas, Nebraska and other States. There is another similar species closely resembling it which occurs further south, and is common in the Gulf States.

The leaves are heart-shaped and the blossoms are large, nearly white, and grow in large clusters, as shown in Fig. 35. The tree grows very rapidly furnishing desirable timber for fence posts, telephone poles, railroad ties, etc. In Kansas, large areas have been planted by the railroad companies for the purpose of growing ties. Beekeepers situated near such plantings should find the trees of material value.

**CATNIP (Nepeta Cataria).**

Catnip, or catmint, was introduced from Europe, and cultivated in herb gardens. It is thus an escaped introduction and has become very widely naturalized in the United States, although it is generally considered a weed. It is usually found only in the vicinity of buildings and gardens, and seldom spreads into the fields to any extent. Almost all of us remember the popularity of catnip tea among the grandmothers of an earlier generation. The plant is a perennial, growing from 2 to 3 feet high, with flowers in clusters, the more conspicuous ones being in a terminal spike. The blooming season is rather long, and the bees visit it very freely. Apparently, the plant yields much nectar, although it is seldom present in sufficient quantity to test its real value as a honey producer. If it had sufficient value for other purposes to justify its cultivation, it would probably be an important source of nectar.

**CATSCLAW, see Acacia.**

**CAT'S EAR (Hypochaeris radicata).**

Cat's ear, sometimes called California dandelion, is abundant west of the Cascade Mountains in Washington and south to California. It is a naturalized European weed in pastures and fields, blooming in midsummer. According to H. A. Scullen, it supplies considerable nectar in Washington. It is amber color and in some localities darkens the fireweed honey.

**CELASTRUS Scandens, see Bittersweet.**

**CELERY (Apium graveolens).**

The blossoms of the cultivated celery yield nectar abundantly, and where grown for seed, it is a valuable source of honey. In the seed belt of California it yields well, as the following will indicate:

> "I saw the hives stacked five or six high and on opening them we found them jammed full of honey; in fact, the bees should have had room long before, but Mr. Gear had had difficulty in getting help, and the bees had got ahead of him. The colonies were so crowded that the space between the frames and the tops of the hives were built full of burr combs. All this honey was from celery and parsnip. * * * On our arrival at the field it was easy to see that there was honey in the blossoms. In the sunlight the little drops of nectar gleamed like myriads of little diamonds. * * * I tasted some of the raw nectar from the celery. Sure enough, there was quite a strong suggestion of celery flavor."—E. R. Root, Gleanings, Nov., 1919, page 712.

**CENTAUREA.**

There are several species of centaurea which yield nectar. The common cornflower of the gardens **(Centaurea Cyanus),** also known as blue-bottle, bluet, ragged sailor or batchelor's button, is a good honey plant. The bees work upon it from morning till night, though it is seldom sufficiently abundant to be important as a source of surplus. Richter lists this species from California as commonly cultivated. He also lists the Napa thistle, or tacalote **(Centaureau melitensis),** as yielding some honey of light amber color, good flavor and fair body. This species is known in the southeastern States as Lombardy star thistle. (See Star Thistle.)

**CENTURY PLANT (Agave).**

The agaves are an important group of long-lived perennial plants native to Tropical America, Mexico and, to some extent, to the southwestern United States. Each plant has a cluster of numerous fleshy leaves and, when blooming, a tall flower stalk. There are at least five species native to the United States. The range is southern New Mexico, Arizona and Cali-

Fig. 37. The century plant is slow to bloom, but is a striking sight when it does so.

fornia. The best known is the common century plant **(Agave americana),** an introduced species, cultivated for ornament. This is a conspicuous figure of ornamental planting in southern California.

In Mexico some species of agaves furnish fibre, while others are the source of pulque and mescal, intoxicating drinks much used in the country below the Rio Grande.

The plants do not bloom until they are several years old. The flower stalks grow very rapidly and reach a height of 25 or 30 feet within a few weeks' time. When in bloom they secrete nectar in abundance, and the bees swarm over them in great numbers. As will be seen by the illustration, the flower stalks support innumerable blossoms, so that a single plant will yield a considerable amount of honey. The fact that the plants are nowhere abundant in this country, together with the long period which must elapse before they bloom, makes it improbable that they will ever be of much importance to American beekeepers.

**CEPHALANTHUS, see Button Bush.**
**CHAMISE, see Greasewood.**

**CHAPMAN HONEY PLANT (Echinops sphoerocephalus).**

The Chapman honey plant was introduced from France about 1885. The bee journals of 1886 and 1887 devote a large amount of space to a discussion of this plant. It was brought prominently to the attention of American beekeepers by Hiram Chapman, of Versailles, New York, who planted about three acres of it at that place. He made such glowing reports of the plant at the National Beekeepers' Convention that a committee of prominent men was appointed to visit the Chapman home and report on the new plant at the convention of the following year. They made a lengthy and very favorable report, which is published in full on page 28 of the American Bee Journal for January 5, 1887.

Numerous beekeepers secured seed, and so attractive did the plant prove to the bees that favorable reports appeared frequently in the columns of the journals for the next few years. However, the great expectations were not realized, for it soon disappeared, and is seldom mentioned in current literature. The following quotation from Dr. C. C. Miller, which appeared in Gleanings, in December, 1918, is probably a correct estimate of the value of the plant:

> "After reading the British Bee Journal of September 26, I should have made a vigorous effort to secure a supply of seed of **Echinops Sphoerocephalus,** if I had no previous experience with the plant. No bee plant that I have ever grown was so attractive to the bees. Whenever the weather was favorable the heads were crowded. I have counted fourteen or fifteen bees on one at the same time.'
>
> This is the Chapman honey plant that had a big boom in this country a number of years ago; but it is not heard of now, and is not included among the honey plants in the bee books. Upon its introduction I planted quite a patch of it, and like Mr. Harwood, I never saw the bees so thick on any other plant. But close observation showed that the bees were not in eager haste in their usual way when getting a big yield, but were in large part idle. It looked a little as if the

plant had some kind of stupefying effect on them. At any rate, I should not take the trouble to plant it now, if land and seed were furnished free.

**CHAYOTE (Sechium edule).**

Chayote is a vegetable of the squash family, commonly grown in the American Tropics. It is found in Mexico, Cuba, Porto Rico and other countries in that latitude. There has been some discussion of the plant in the bee magazines and occasionally the plants have been grown in American gardens. That it is a valuable honey plant there can be but little doubt. J. J. Siebert, writing from Porto Rico to the American Bee Journal, says that it is all that it is claimed to be, and that as a source of nectar it has only one rival, the banana, blossoming all the year round. The following is from the U. S. Department of Agriculture, Bulletin No. 28:

"As in other vegetables of the squash family, the stamens and pistils are in separate flowers, pollination taking place through the agency of insects. To attract these, the flowers of both kinds, but especially the pistillate, yield abundant nectar, which is secreted in ten glands, two at the base of each of the lobes of the corolla. In most of the countries into which it has been introduced, beekeeping has not been a regular industry, and the value of the chayote as a source of honey has not been noticed, but the reports of experimenters in New South Wales contain very emphatic statements on the subject:

'When the plant is in flower I have noticed that the vines were swarming with bees, and as flowers are scarce in the autumn, the plant will no doubt be valuable as a honey-producer.

'The plant, which spreads over a large area, commenced flowering at the close of the year, and has been well laden with mellifluous blossoms ever since. The bees are extremely fond of the chocho, and with the apiarist the newly-introduced plant must become a strong favorite.'

"The chayote differs from many cucurbitaceae in producing numerous flowers on each fertile branch. It has long been known that the flowers of this family are rich in honey, but from the standpoint of the beekeeper they have been considered of little importance, because seldom accessible in sufficient amount, though in the United States fields are recognized as good bee pastures. The chayote seems to make up by numbers what the flowers lack in size, so that the yield of honey may be larger than in related plants. In addition to this there is the fact that Sechium is a perennial bloomer in the Tropics, and in the subtropical regions has a very long season. It is thus possible that in the regions like parts of Florida, where beekeeping is already an established industry, the honey-producing qualities of the chayote may be found of practical account in connection with its other utilities."

**CHEROKEE ROSE (Rosa laevigata).**

The Cherokee rose is found from the Coast Region of the South Atlantic States westward through Georgia, Alabama, Mississippi and Louisiana to eastern Texas. It occurs also in California. It was in Alabama that the author first heard it mentioned as a source of nectar. Later reports from California indicated that bees sometimes find nectar from this source, though most of the roses yield only pollen. H. B. Parks states that he has observed the bees getting honey from this source, and M. B. Talley,

of Victoria, Texas, states that he has observed the bees gathering nectar from it in Mississippi and also at Victoria. It is probably of little importance, unless it be as a source of pollen.

**CHERRY (Prunus cerasus).**

The cultivated cherry is closely related to the plum and is equally attractive to the bees. Both bloom at about the same time. In California the cherry is reported as one of the best of the fruit trees for honey production. In the East it is valued principally for stimulating early brood-rearing.

When the weather is warm and bright during its period of bloom a great variety of insects may be found on the blossoms. Bees are seldom strong enough to store surplus from cherry. (See also Wild Cherry.

Fig. 38. Cherry blossoms.

**CHESTNUT (Castanea dentata).**

The chestnut is an important timber tree from northern New England and Ontario to Michigan and along the mountains to Georgia. It is a tall and slender tree in the forests, but a magnificent spreading shade tree when grown with sufficient room. It sometimes reaches a height of 90 to 100 feet.

As a source of nectar it is probably nowhere important, though it yields pollen in June or July. E. E. Hasty, writing in the American Bee

Journal, from Toledo, Ohio, (Sept., 1906), reports that there the bees roar on chestnut bloom, even when basswood blooms at the same time.

It is frequently listed as a source of honey, but the author can find no authoritative records of surplus stored from it.


Fig. 39. Bloom of China-tree

**CHINABERRY, see Wild China.**

**CHINA TREE (Melia azedarach).**

The China tree, also known as pride of India, is a native of the Far East, probably coming from China. It has become naturalized in the Southeastern States from the Atlantic Coast to Texas. It is found as far north as Arkansas and Virginia.

H. B. Parks reports that in Texas it is a fairly good honey plant,

Fig. 40. The chinquapin.

blooming very early in the season. On account of its early blooming, it is principally valuable to stimulate early brood rearing.

This tree should not be confused with the Wild China, which see.

**CHINESE SUMAC, see Varnish Tree.**

**CHINQUAPIN (Castanea pumila).**

The chinquapin is a shrub or small tree common from New Jersey and southern Pennsylvania southward to Missouri and Texas. It is well known to the beekeepers in parts of Alabama, Georgia and north Florida, where it flowers in May. In Arkansas, it is a large tree, reaching a height of fifty feet in some cases.

In some localities beekeepers report good crops of honey from chinquapin, but the quality is inferior. It is dark and strong, with a bitter taste. Some use it for feeding to replace the better grades of honey which may be taken from the bees. In color it looks like New Orleans molasses, and a sample, in the author's collection for several years, shows no tendency to granulation.

**CHITTAM, see Buckthorn.**
**CHOCTAW ROOT, see Dogbane.**
**CHOKE CHERRY, see Wild Cherry.**

**CHRISTMAS BERRY, or CALIFORNIA HOLLY (Heteromeles arbutifolia).**

The Christmas berry is known also as toy-on or tollon berry, as well as California holly. It is common along the streams and on the mountainsides of California, where it flowers in June and July. It has white flowers and the bright red berries ripen in late autumn. The berries, according to C. D. Stuart, are acid and slightly astringent, though not unpleasant. He states that the berries were eaten by the Indians as a kind of salad, and that a wine-red drink is sometimes made from them after an old Spanish-Californian recipe. The plant is much used for Christmas decoration on the Pacific Coast.

According to Richter, the plant is the source of a thick amber honey of decided flavor, which candies with a coarse grain, within two or three months after extraction. He reports surplus from this source in Monterey, Colusa and Nevada Counties, California.

Jepson gives the range as "Throughout the coast ranges and Sierra Nevada, and southward to southern and Lower California. Frequent along streams and gulches in the lower hills, and also abundant on stony slopes at middle elevations, especially from Napa to Humboldt Counties.

At Visalia the author heard reports of an average of a case per colony of surplus honey from this source in the mountains.

**CITRUS FRUITS, see Oranges, Lemons, Etc.**

### CLEMATIS.

The white clematis is commonly known by the name of virgin's bower, but also has several other local names, such as love vine, traveler's joy and devil's hair. Fig. 42 shows the delicate white blossoms and the leaf, and Fig. 43 shows a mass of vines on a roadside fence.

Fig. 42. Blossom and leaf of white clematis.

The range of the plant is from Nova Scotia and Ontario west to Lake Winnipeg and Nebraska and south to Louisiana and Florida. It may be expected almost anywhere east of the Mississippi River. It is a slender climbing vine on the borders of woods, roadsides and hedgerows. The blossoms are white and fragrant, blooming in midsummer. It is much sought by the bees, and apparently produces considerable nectar. It is doubtful whether the plant is anywhere sufficiently abundant to make an appreciable difference in the production of the hive.

Richter, in his "Honey Plants of California," reports a related species, the hill clematis, **(Clematis ligusticifolia,** as common in the hilly districts almost throughout California. It is said to produce "a great deal of pollen and probably some honey," but it is not known to produce surplus. Common also in the Rocky Mountains.

### CLEOME, see Rocky Mountain Bee Plant.

### CLEOMELLA (Cleomella angustifola).

The Cleomella is very similar to the Rocky Mountain bee plant, or cleome. The flowers are small and yellow and the plant does not grow so tall as the cleome.

An Oklahoma beekeeper reports as follows:

"It seems to be a remarkable honey plant. It was in bloom for more than ten weeks during the dry season, and bees worked upon it freely every morning. The blossom is very fragrant, sweet, yellow, and is at the branches. It keeps crowding out a new growth and blooming, forming small purse-shaped seed pods as the blossoms drop. The growth is much like sweet clover or yellow mustard, but forming a larger spreading top. Some plants grow four feet tall and three feet

across and an inch through at the butt. It is an annual, and no stock will eat it."—M. S. Hubbell, Helena, Okla. American Bee Journal.

Cleomella is found from Nebraska to Utah and south to Texas.

**CLETHRA, see Pepperbush.**
**CLIMBING MILKWEED, see Bluevine.**

**CLOVER (Trifolium).**

The clovers are by far the most important American honey plants. If we include the closely related alfalfa and sweet clover, they probably are the source of more surplus honey than all the other plants together.

Fig 41. The Christmas berry, or California holly.

They are to be found in nearly every part of America and yield nectar more freely than most plants. The quality of clover honey is of the best and in quantity of yield it ranks high, under favorable conditions. If the whole group was to be removed, honey production as a commercial proposition would decline to a very large degree.

Clover seems to yield most heavily in the northern part of its range and gradually declines southward. White clover is the most important of the group. Alsike is quite as valuable where equally abundant. The corolla tubes of red clover are usually too deep for the honeybee to reach the nectar, but occasionally some honey is secured from this source. (See Red Clover). Each of the clovers is considered separately. (See White Clover, Alsike, etc.)

**COCKLEBUR (Xanthium canadense).**

The cocklebur is a coarse weed, common in fields and waste places from Louisiana. In Texas, Scholl lists the plant as a source of pollen in clinging to clothing and to the hairs of horses and cattle.

There is an occasional report of honey from this source, especially from Louisiana. In Texas, Scholl lists the plant as a source of pollen in late fall.

Fig. 43. White clematis on a roadside fence.

**COFFEE BERRY, see Buckthorn.**

**COLIMA (Xanthoxylum pterota).**

Colima is a species of prickly ash common to the valley of the lower Rio Grande River. It is a small shrub with zigzag branches, armed with short curved thorns. The flowers are in axillary clusters.

Colima is reported as yielding but a light flow, of principal value for stimulative purposes. At Mathis, Texas, Wm. Atchley reports that he had a good surplus flow from colima in 1900. The honey was golden and very thick, weighing 12½ pounds to the gallon. The flavor was good. Although he kept bees in that vicinity for a number of years he secured surplus from Colima but the one time. (See also Prickly Ash).

**COLORADO—Honey Plants of.**

Practically all surplus is secured from alfalfa and sweet clover, with an occasional crop from cleome. The rosin weed **(Grindelia squarrosa)** yields considerable honey of low grade which often spoils the grade of

the white honey by being mixed in the supers. Narcissus, parsley and prairie clover are prairie plants which attract the bees freely. Wild onion yields some honey. Dandelion and fruit bloom are important for spring brood rearing and canteloupes yield some surplus in the Rock Ford region.

Fig. 44. A white clover field in Iowa.

Sunflowers, mentzelia, lupines and loco weeds add something to the sum total brought to the hives. The white clematis is very common along the streams, as are willows. Wild currant is common in the mountain canyons. **Gaura coccinea,** the red gaura or ragged lady, is much sought by the bees for both honey and pollen. Oreocarya is a desert plant which yields surplus, but which is rapidly disappearing through cultivation of the land on which it grows.

**COLUMBO, see Monument Plant.**

**COMA (Bumelia lycioides).**

Coma is the Mexican name for southern buckthorn **(Bumelia lycioides),** which is found from Florida north to Virginia and west to Texas. It is also known as ironwood. It is a spiny shrub with flowers in dense clusters. In South Texas it is also known as coma and is frequently reported as an important source of honey. It blooms there from October to February and produces nectar freely. At Rio Hondo, in the lower Rio Grande Valley, beekeepers reported to the author that a flow of six weeks from coma, from September to November, was common, and that swarms issuing as late as December had gathered sufficient honey from this source to carry them through. The honey is said to be light amber in color and

of good quality. The flow varies greatly, depending upon the rains. (See also Gum-elastic.)

**CONE FLOWER (Rudbeckia).**

The cone flowers, also called golden glow, are not often mentioned as honey plants, yet the bees visit them freely and apparently they are the source of some nectar. The plants are widely distributed east of the Missouri River and are probably of limited local importance.

Coma in bloom. This species (*Bumelia angustifolia*) is abundant from Pearsall, Texas, to the Rio Grande River, blooming from October to February, and is the best of the group.

**CONNECTICUT—Honey Sources of.**

The clovers, alsike and white clover, occur all over Connecticut and yield nectar freely. Goldenrod and asters are also important. Buckwheat, wild

raspberry and milkweeds all yield surplus under favorable conditions. Basswood, locust maple and clethra are among the valuable trees and shrubs. Fruit bloom, willow, etc., are important in early spring. Some honey from tobacco is reported in Connecticut.

Fig. 45. Blossoms of the cotton plant. (U. S. Department of Agriculture.)

**CORAL BEAN or FRIJOLILLO (Sophora secundiflora).**

The coral bean is a small tree common along the streams of Texas and New Mexico, and southward to the interior of Mexico. The Mexicans call it frijolillo. The beans are said by Coulter to be used by the Indians as an intoxicant. The beans are round and red and as large as small mar-

bles. They contain a powerful poisonous alkaloid. Some beekeepers have expressed a fear that the honey might be poisonous to the bees, though apparently there is little grounds for such fear. The tree is abundant along the Nueces River in the shade of larger timber and was yielding nectar very freely at the time of the author's visit to that section on March 10, 1918. There had been a long dearth of nectar and the bees were extremely short of both honey and pollen. The new nectar was coming in in considerable quantity and the honey stored had a peculiar flavor. The tree is particularly abundant in the vicinity of Matagorda Bay.

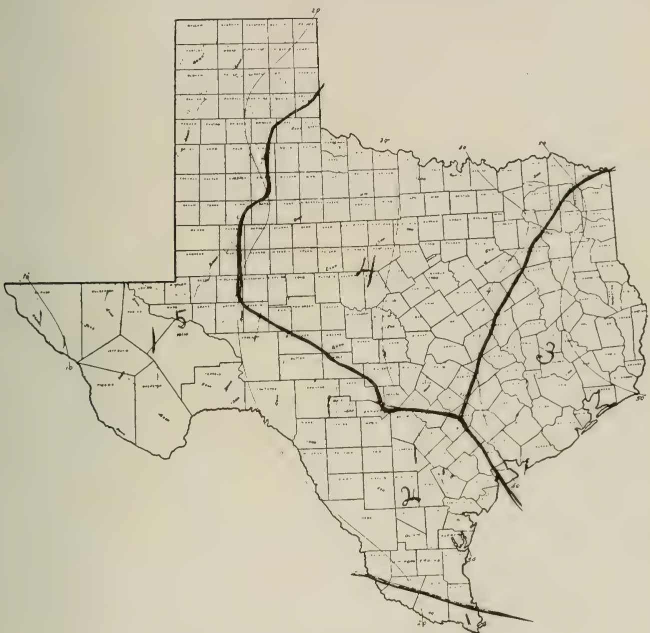


Fig. 46. Honey plant regions of Texas.

**CORAL BERRY, see Indian Currant.**
**CORAL SUMAC, see Poisonwood.**
**CORN, see Indian Corn.**
**CORNEL, see Dogwood.**
**CORN-ITCH, see Cow-itch.**

**COTTON (Gossypium herbaceum).**

Although the cotton plant is found growing wild in many warm countries, in the United States it is known only as a staple field crop. It was

brought to this country as early as 1621, and has been the most important plant grown on southern plantations since the early development of the country.

The plant thrives in a warm and humid climate, and needs five to six months of warm weather. However, it is grown successfully under semi-arid conditions in parts of Texas and other Southern States. The so-called cotton belt extends from the nortwhest corner of Texas south to the Rio Grande, and east to the Atlantic seaboard. A limited acreage is grown in California, but, excepting very restricted areas, it is not important outside the territory mentioned. Texas, Mississippi, Alabama and Georgia are perhaps the most important of the cotton-growing States. The Carolinas, Louisiana and Oklahoma also grow it in large areas.

Honey production reaches its highest development in localities where good nectar-bearing plants are grown in large acreage. Hence we find beekeeping thriving in dairy communities, where alsike and white clover are grown abundantly. We also find the beekeepers prosperous where alfalfa is an important crop. In the Southern States, cotton is the one field crop grown on a sufficient scale to offer ideal conditions for the beekeeper. However, cotton is fickle in its behavior, and cannot always be depended upon to produce nectar, no matter how abundant the crop. In some cotton-growing districts the beekeepers swear by cotton, while in other localities they declare that it is of little value. The character of the soil seems to be a very important factor in the secretion of nectar by this plant. The vigor of the growth and the amount of available plant food in the soil are also important. Reports from different sections indicate that the quality of the honey varies in different sections.

W. D. Null, of Demopolis, Ala, wrote to the author as follows:

> "This, you know, was for sixty years the heaviest cotton-growing section in the nation. Bees will not work cotton if they can work anything else, even bitterweed. It yields honey of very poor quality, and never very much, some years none at all. Weather conditions must be just right, and that don't come often. The honey is the same grade as the most honeydews."

In contrast, we find the following report of good honey and abundant yield in American Bee Journal for 1907, page 267:

> "Cotton blossoms furnish a great deal of excellent honey, and the theory that it explodes or ferments is all bosh. It makes an excellent rich honey, oily, and it is not liked so well by some until they get used to it."—Jules Belknap, M. D., Sulphur Springs, Ark.

When the writer made his first trip through Georgia he was much puzzled by the different reports of apparently good observers in different parts of the State. The matter was finally explained by a beekeeper who had lived in different localities, by the variation in behavior of the plant under different conditions. There is perhaps no important honey plant which varies so much, in the quality of its nectar, as does cotton. The poor quality in some places can doubtless be explained by the fact that the flow is not abundant, and is mixed with other low-grade stores. However, honeydew is also sometimes reported from the plant itself.

"Sometimes, during a damp spell, the cotton gets covered with vast numbers of aphis, and the upper side of the leaves will first get gummy and then will even drip a kind of dirty-looking sweet fluid. If there is anything else on hand the bees will not touch it."—W. H. Alder, Callahan County, Texas, page 334, American Bee Journal, 1899.

It is needless to say that this would make a poor product, and it is not improbable that honeydew is sometimes secured from cotton in localities where it seldom yields nectar. The secretion is apparently dependent far more upon soil than upon any other condition. Upon the black, wavy lands of Texas and upon other soils, it reaches its highest development. The boundary of the belt, where cotton yields freely and where it does not, is very marked in Texas. North of the escarpment which runs across Bexar County, Texas, near San Antonio, it is an important source. South of that line few beekeepers report it as dependable. North of this line the soil is black and heavy; south it is sandy. Wherever the writer has found beekeepers on sandy soil, they have reported the yield from cotton as uncertain; while on the heavy soils they report it as fairly constant, with suitable weather conditions. The map shown herewith, Fig 46, roughly outlines the heavy section where honey from cotton is important in Texas. Cotton is grown east, south and, to some extent, west of that line. In east Texas cotton is reported as yielding well on river bottom lands and but little on the hills. In the southern sections, and also in other States, an occasional crop is reported where it does not yield regularly:

"We had a very dry, sultry spell here the latter part of last August, and up to that time the bees were living from hand to mouth. All at once they began storing from the cotton bloom, though it looked as though cotton was going to die in the fields from drought and heat, yet it yielded until the bees had stored from 30 to 60 pounds per colonly."—J. J. Wilder, Cordele, Ga., American Bee Journal, page 141, 1906.

On suitable soils it is one of the most dependable sources of nectar:

"The apiarist who has his bees located within range of extensive cotton areas can count on at least an average crop year after year, with more certainty than many of the other numerous honey yielders which we have."—Louis Scholl, page 652, Gleanings, 1912.

"My main sources for surplus are mesquite trees, the cotton fields being the second of importance in the central and northern parts of the State, or throughout the black land region. On sandy or light soil cotton yields very little honey. * * *

"The yield is good, averaging about 73 pounds of bulk comb honey per year. One year it was over 100 pounds. Honey from cotton is very light in color, the comb very white, and of excellent flavor when well ripened. As soon as cool weather sets in this honey fairly draws out in long strings, when handled with a spoon."—Gleanings, page 1313, 1907.

From the above it will be seen that cotton honey is of good quality, at least in some localities Samples said to be from cotton from Georgia, are strong and of rather poor quality, while cotton honey received from Texas is light in color, of mild and rather pleasing flavor. The honey from Cotton granulates very quickly. That produced in the Southeastern States also has the effect of bursting the containers, possibly from the effects of fermentation. The humidity of the atmosphere evidently has a

marked effect on the quality of the honey from this plant. The following reports indicate the quality:

"As to the quality of cotton honey, I can say from my own experience, that it varies in color from light amber to almost water white. While I do not consider it equal to white clover in flavor, it is superior to basswood. * * * The flow increases toward the last of the season, and if we can get two weeks of nice weather after frost it amounts to a considerable increase in the crop."—J. D. Yancey, Hunt County, Texas. Gleanings, page 162, 1910.

"It did well on our rich bottom land and yielded a fair crop of the finest honey it was ever my pleasure to see. It was so thick that it was almost impossible to extract it, and entirely out of the question to strain it through a single thickness of cheese-cloth. It was light in codor, mild in flavor, and very heavy, and in my opinion superior to any honey ever shipped to this locality, not excepting huijilla. The long drought and consequent absence of all other bloom, enabled us to get a purer cotton honey than we had ever been able to get before. Again, in the late fall, when the weather began to get cool, our cotton took a second growth, soon blooming profusely, and by accident we got also a fair fall crop."—O. Saunders, Trenton, Texas. Page 734, Gleanings, 1910.

One great advantage of the cotton flow is its long continuation. In Texas it begins to bloom in May or June, and the bees work it steadily until late fall, often November. Extra cultivation or fertilization of the soil increases the vigor of the plant and the nectar flow is increased accordingly:

"I can remember when the bees gathered only enough nectar from it to stimulate brood rearing, and now we get from one to three supers of surplus from this source alone. * * * On land where we used to make a bale of cotton to 4 or 5 acres, now we make 1 to 2 bales per acre, using high grades of commercial fertilizer and more prolific varieties of the plant. It yields more where it grows best, and of a much longer duration."—J. J. Wilder, Cordele, Ga. Page 237, American Bee Journal, 1911.

Bees get nectar not only from the cotton blossoms, but from extra floral nectaries as well. At times almost entirely, and to gather freely they seem to neglect the blossoms for the extra-floral nectaries. Some of these are located under the flower and begin to secrete nectar before the blossoms open. Others are located on the under sides of the leaves, and vary from one to three on each leaf. When atmospheric conditions are favorable, these glands secrete abundantly and the nectar gathers in drops. At times it is so abundant that the men cultivating get their clothes saturated with the nectar, from the brushing of the leaves against them. Later in the day the heat of the sun evaporates most of the moisture, leaving the clothing sticky. In hot and dry weather the flow is on in the morning and again in the evening, while in cloudy or damp weather it lasts all day.

When first gathered, the honey is said to be very thin and clear, with a strong and nauseating taste, resembling the taste of the plant itself. As the moisture is evaporated and the nectar ripens in the hive this disagreeable taste is lost to a large extent. During a heavy flow a strong odor is frequently present in the apiary, which can be noticed at some distance from the hives. Scholl compares this odor to that of crushed cot-

ton leaves. He reports that at times it becomes so strong as to have a sickening effect on the apiarist, even interfering with his work, on calm days.

The heaviest flows come from rank-growing plants on rich soils, during warm and wet weather. At such times the honey is lighter in color and superior in quality, while the honey stored from plants growing on light soils during dry weather is darker and strong in taste.

Pollen from the cotton plant is white in color, and is produced in abundance from the large bell-shaped flowers. When the bloom first opens it is white, later turning pink.

**COTTON-GUM, see Tupelo.**
**COTTONWOOD, see Aspen.**

**COW-ITCH (Cissus incisa).**

The cow-itch is a climbing vine found from the coast of Florida to western Texas and north to southern Arkansas. In south Texas it is called "yerba del buey," according to Coulter.

Scholl states that it "yields sufficiently to keep the bees out of mischief during a dearth, and giving surplus when abundant." At Buffalo and Palestine, Texas, the author found reports to the effect that cow-itch was a heavy yielder of nectar, bees beginning on it as soon as the basswood bloom closed. It blooms from June till October, with fruit in all stages. The honey was reported to be light amber in color and of good flavor. R. A. Nestor reported that he had secured as high as 35 to 40 pounds of surplus per colony from this source mixed with partridge pea. It is also called corn-itch.

**COWPEA (Vigna sinensis).**

The cowpea is widely cultivated in the warmer regions of the old world and in our own Southern States. It is grown for forage and for green manure. The plant is more closely related to the beans than to the peas.

R. A. Nestor reports that it yields freely in east Texas, and where planted in sufficient acreage yields surplus. The honey is very dark in color, but of mild flavor, according to his report.

The nectar from cowpeas is secreted by extra floral nectaries and beekeepers are often mystified because the bees are working at the "joints" instead of on the flowers. Some report that bees gather nectar from the flowers, also.

The following reports indicate the value in different localities:

"There is no finer honey plant than the cowpea, while it lasts, but it blooms only about a week. During this time, if the weather is fair, the bees swarm over the fields from early morn till dewey eve."—J. D. Rowan, Tupelo, Miss. Gleanings, Sept. 15, 1909.

"The cowpea is one of our most abundant sources of honey for late summer. The crop is planted here from May 1 to August 1, and furnishes nectar through a considerable period of otherwise scarcity.

Unlike other plants, the stems, and not the blossoms, secrete the nectar as the young pods are forming. These the bees work upon excessively. The honey is of good body, thick, deep, approaching dark yellow in color, and of strong taste like that of tulip-poplar, only stronger, with a somewhat slight, wild-green-bean-like flavor."—C. C. Gettys, Hollis, N. C. Gleanings, Sept. 14, 1909.

"A small patch of peas was covered with bees from morning till night. Nearly all of them were working on the stalks, as usual; but here and there I saw a few Italians pushing their tongues down into the blossoms. I have never noticed any pollen from the field peas."—Mrs. Ameda Ellis, Fremont, Mo. Gleanings, June 1, 1910.

"The peas bloom when there is a honey dearth and the bees gather honey from them. However, I notice they do not work on them much if there is a better honey plant blooming at the same time. My bees get a good deal of nice honey from them."—G. H. Latham, Jr., Rapidan, Va. Gleanings, May 15, 1910.

Fig. 47. Crocus blossoms are among the first to furnish pollen in spring.

**COYOTE WEED, see Turkey Mullein.**

**CRAB APPLE (Malus).**

There are several species of wild crab apples native to America. The fruit is small and sour and of little value. The blossoms are rose colored and very fragrant, making the tree worthy of cultivation as an ornamental. As a source of honey the wild crab apple ranks with the cultivated

apple and other fruit trees. The blossoms appear from March to May and serve to stimulate spring brood rearing, though where abundant, strong colonies may gather some surplus.

The southern crab apple **(Malus angustifolia)** occurs in open woods from southern Pennsylvania sonth to Florida and west to Louisiana and Missouri.

The American crab apple **(Malus coronaria)** is common from eastern Canada to Michigan and south to Alabama and South Carolina. It is a small tree and often grows in dense thickets, where it furnishes ideal bee pasturage.

The Soulard crab apple **(Malus soulardi)** is much like the American crab apple in tree and flower, but has a larger fruit, which leads some authors to regard it as a hybrid between the cultivated apple and a native species. It is sometimes cultivated for its fruit, which is used as a substitute for quince. It occurs in the wild state from Minnesota to Texas, but not very common.

The Oregon crab apple **(Malus diversifolia,** is a native of the Pacific Coast from Alaska through Western Canada south to California. The fruit was formerly dried by the Indians for winter use.

All the wild crab apples are valuable sources of nectar, though the principal value is to stimulate early brood rearing.

### CRIMSON CLOVER (Trifolium incarnatum).

Crimson clover is grown in the Southern States, but is not hardy in the North. It is an earlier bloomer than the other clovers. The blossoms are more showy than either alsike or red clover. The plant is an annual, and must be resown to perpetuate a field.

The honey yield is reported to be good and the quality similar to that of the other clovers. It is nowhere grown on the scale of the others, so is not so well known as a source of honey.

Bonnier gives it third rank as a honey yielder, while the British Bee Journal states that it is about on a par with buckwheat, and that neither is satisfactory when honey of later yield is worked for.

Niswonger lists it as a very important plant in Kentucky, and states that the honey is of a very light yellow color of good quality.

### CROCUS.

A group of early spring flowers native to the Mediterranean region of Europe, widely cultivated in gardens. Among the first flowers to bloom, they are very attractive to the bees, as shown in Fig. 47.

### CROTON (Croton).

Scholl lists four species of croton as yielding pollen and nectar in Texas, though none of them are of much importance. Richter states that the bees visit the small blossoms of **Croton californicus** in large numbers. The author can find no records which indicate that the plants are of special value anywhere.

Fig. 48. The crownbeard is a favorite of the bees.

**CROWNBEARD (Verbesina).**

There are several species of this plant, some of which are very attractive to the bees. They may be found in the borders of open woodlands and partially shaded situations of the region east of the Missouri River. Where sufficiently abundant the crownbeard is the source of a considerable quantity of nectar. A coarse weed, growing four to eight feet tall, with winged stems and yellow, or sometimes white, blossoms.

**CUCUMBER (Cucumis sativus).**

The cucumber is dependent upon bees for pollination of the blossoms. The flowers are imperfect, the male organs being contained in one flower while the female organs are in another. For this reason it is necessary that insects carry the pollen fron the staminate blossoms to the pistillate ones. Where pickles have been grown under glass, they have proved unfruitful until bees are given access to the bloom. Formerly the pickle growers fertilized the blossoms by hand to some extent. This was very laborious. According to B. N. Gates (In 3rd Report Iowa Bee Inspector), one grower has forty acres under glass in Massachusetts and the industry requires about three thousand colonies of bees annually to serve in the cucumber greenhouses.

In some sections, cucumbers are grown extensively for pickles. At Marengo, Ill., Doctor Miller reports that about 600 acres are planted to pickles. He reports that, whereas he formerly had no fall flow, his bees now gather some fall crop, part of it evidently from cucumbers. There are numerous localities where cucumbers are of some importance to the beekeeper. Lovell states that the honey is pale yellow or amber and has at first a rather strong flavor, which largely disappears in time.

**CUP PLANT (Silphium perfoliatum).**

Cup plant, also called rosin weed, is a common square-stemmed plant with leaves grown together at the base forming a cup. It grows from four to eight feet high and is abundant on rich lands, along streams and in woodside borders, in the Mississippi Valley. It produces numerous large yellow flowers and, where plentiful, furnishes considerable forage for the bees. It is probably seldom important as a source of surplus.

**CULVER'S ROOT (Veronica virginica).**

The Culver's root is found from New England and Ontario to Manitoba and southward to Arkansas and Georgia. There are reports to the effect that the bees fairly swarm on this plant, but apparently it is not of much importnce to the beekeeper.

Fig. 49. The cup plant.

**CURRANT (Ribes).**

There are several varieties of the cultivated garden currant and many species of the wild currants which are valuable sources of nectar. There are at least seven species of wild currant native to New Mexico. It is probable that some species of wild currants are to be found in every State where bees are kept. In the vicinity of large plantings of cultivated currants they are an important source of nectar, but generally speaking, they are a minor source and of chief value for pollen and for stimulating early brood rearing along with most other fruits.

**CYNOGLOSSUM, see Hound's Tongue.**

# D

**DAHOON, see Holly.**

**DANDELION (Taraxacum officinale).**

The dandelion is one of the most widely distributed plants in America. Originally introduced from Europe, it has been naturalized over practically the entire continent. As each plant will produce hundreds of seeds, which are borne for long distances on the wind, its wide distribution is not surprising. The plant is sometimes used for medicinal purposes, serving as a mild laxative and tonic. The tender shoots are very popular as

Fig. 50. The much despised dandelion is a valuable source of nectar.

a table delicacy in early spring, with those who are fond of greens. The bright yellow flowers are very showy, and if the plant was not so abundant, would be considered attractive. The warfare against the dandelion is as relentless and as continuous as the campaign against the house fly. Little is to be accomplished by digging the plants from one's own lawn, when a whole pastureful are going to seed a mile or two away.

The beekeeper has little to complain of from these weeds, as there is nothing of greater value during the short period of bloom. While the honey gathered from dandelions is dark and strong, most of it will be consumed for brood rearing. Occasionally a small surplus will be secured from this source, but it blooms so early that surplus is unusual. Large quantities of pollen as well as nectar are produced, so that a large acreage of dandelions within reach of the apiary is much to be desired. Fig. 50 shows the plant as it appears during the period of bloom, with blossoms and unopened buds.

Hon. Eugene Secor, the beekeeper's poet, has written a number of things regarding the intimate relation existing between bees and flowers, and for one of these, the dandelion furnished the inspiration:

"Here's a bee, my children see!
Gathering sweets for you and me,
On Sir Dandy Lion's crown;
She is yellow that was brown,
Yellow with the golden dust
Lent to her in solemn trust;
Blossoms bart'ring gold for gold.
Through this dusty trader bold,
Dandy Lion seeks a bride,
Sends his offerings far and wide
With his trusty friend, the bee,
And with Honey pays the fee."

**DATE-PLUM, see Persimmon.**

**DEER CLOVER, see Wild Alfalfa.**

**DEER'S EARS, see Monument Plant.**

**DELAWARE—Honey Sources of.**

Clover, tulip-tree, willows, maples, fruit bloom, dandelion, heartsease, buckwheat, blueberry, huckleberry, boneset and asters are among the well-known sources of honey in Delaware. Beekeeping is not highly developed in this State and few pay serious attention to honey production.

**DEVIL'S CLAW, see Acacia.**

**DEVIL'S SHOESTRING, see Bluevine.**

**DEWBERRY, see Blackberry.**

**DIERVILLA, see Bush Honeysuckle.**

**DOCTOR-GUM, see Poisonwood.**

**DOGBANE (Apocynum).**

When not in bloom the dogbane resembles the milkweed. There are several species found in Europe, temperate Asia and North America. In the United States there are two common species, **Apocynum cannabinum,** known as Indian hemp, Canadian hemp or Choctaw root, and **Apocynum androsaemifolium,** the spreading dogbane.

Dogbane can be distinguished from milkweed by the finer stem and smaller leaves. The stems are unusually reddish in color. By Fig. 51 it

will be seen that the flowers are very different. At times the bees work on this plant very freely. It is especially abundant in some localities along the Missouri River in Kansas and Missouri.

**DOGWOOD (Cornus).**

The dogwoods or flowering cornels are a large group of shrubs with showy flowers. Some species are common over all of Eastern America, from Nova Scotia and New Brunswick south and west to Texas. The group is not important to the beekeeper, although occasionally some honey is reported from them. W. C. Brass reports that in central Arkansas smooth dogwood **(Cornus femine),** locally called spicewood or buck-brush, is very abundant, and the bees work upon it industriously during May. He reports, however, that it is uncertain in its value, the bees not

Fig. 51. Dogbane.

working upon it every year. H. B. Parks reports that the bees work upon the red dogwood **(Cornus paniculata)** in Missouri, but the author never knew them to work on this species in Iowa.

Scholl lists **Cornus asperifolia** as yielding nectar freely in Texas, though the species is not plentiful.

**DOORWEED, see Heartsease.**
**DROUTH-WEED, see Turkey Mullein.**

# E

**EBONY, see Texan Ebony.**
**ECHINOPS SPHOEROCEPHALUS, see Chapman Honey Plant.**
**ECHIUM, see Blueweed.**

**ELDERBERRY (Sambucus canadensis).**

The American elder or elderberry is a common shrub from New Brunswick west to Saskatchewan and south to Arizona and Texas. Fig. 52 shows the flower clusters of the common elder **(Sambucus canadensis).** Since

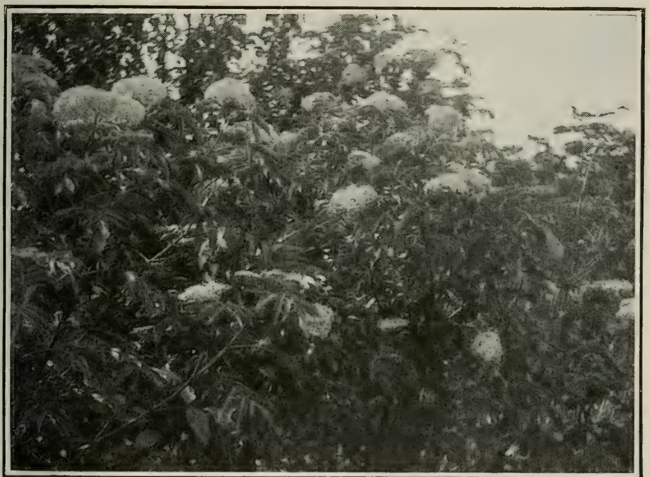


Fig. 52. The elderberry.

the plant blooms late in May and June, there is usually an abundance of pollen in most localities. The bees, however, gather the pollen freely at times, and it is of value where pollen is not plentiful at this season.

The berries are used for pies and wine. The flowers and bark are used to some extent for medicinal purposes.

Richter lists the blue elderberry **(Sambucus glauca)** as important for pollen in California, but as yielding no nectar.

**ELM (Ulmus).**

The elms are very attractive to the bees for pollen. The American

Fig. 53. Blossoms of the blue gum of California (*Eucalyptus globulus*).

or white elm is more especially valuable, and a large tree will attract so many bees that the humming sounds like a swarm.

There are numerous reports of nectar from elm in Texas. Scholl lists the winged elm **(Ulmus alata)** as giving a good yield of honey, surplus sometimes being secured from it. He described the honey as amber in color, with strong and characteristic aroma. He also lists the American elm as a source of nectar.

**EPILOBIUM,** **see Fireweed.**

**ERIOGONUM, Wild Buckwheat or Flat Top.**

A group of low annual or perennial plants common to the Rocky Mountain and plains States. It is a large group and numerous species are to be found from Nebraska to California. In New Mexico the Eriogonum are among the commonest plants, there being something like forty species recorded from that State. The best known is the wild buckwheat of southern California **(Eriogonum fasciculatum).** This is an important source of nectar in that region. The honey is said to be light amber and of good flavor. It granulates readily.

Richter lists it as the most important honey plant in many southern California localities.

In Colorado **Eriogonum effusum** is sometimes known as "heather." According to Herman Rauchfuss it yields nectar nearly every year when there are late rains. It blooms in August and September and is usually in bloom for some time before the bees are attracted to it. He sometimes gets a super of comb honey per colony from this source. The honey he reports to be amber, of fine quality, and strong aroma, of which one does not easily tire.

It grows abundantly on the prairies about Denver. The plant is small and inconspicuous, with minute flowers, and is not generally recognized as a honey plant among beekeepers of Colorado.

> "Wild buckwheat **(Eriogonum fasciculatum)** is one of the principal honey plants of southern California. In the Acton, Antelope Valley and Elsinore districts it is the main reliance. Although quite abundant at lower levels, it does not yield much nectar below 1,500 feet nor above 5,000 feet. The honey is a deep light amber, but of fine flavor, and the comb is very white. The honey has such a heavy body that it is seldom extracted."—J. D. Bixby, Western Honeybee, May, 1917, page 116.

**ERODIUM, see Pin Clover.**

**EUCALYPTUS.**

There are about one hundred and fifty different species of eucalyptus trees, most of which are native to Australia and Tasmania, where they are the most characteristic and important timber trees. Many of them secrete resinous gums, hence are called "gum trees." A number of commercial products are derived from them. They have been widely introduced into California, and, to some extent, also into Florida, Texas and other Southern States. The various species are known as sugar gum, blue gum, mahogany gum ,red gum, stringy bark, white iron bark, red box tree and various similar names. Richter lists 21 species as yielding honey in California. According to this author there is a great variation in the quality of honey from the different species. While some species seem to yield water-white honey of good quality, others produce an amber product of low value. The blue gum **(Eucalyptus globulus)** is said to produce "honey, amber, of acid flavor, heavy body and granulating within a few months. The blue gum is very constant in nectar secretion, even in spite of unfavorable weather, and since it is of wide distribution, considerable quantities of honey come from this source. On account of the

pronounced flavor of eucalyptus honey there is little or no demand for it in the retail trade."

On the other hand, he describes white ironbark **(Eucalyptus leucoxylon)** "a great honey producer, with a beautiful flavor much like vanilla extract."

Almost all of the honey seems to be gathered from the sources which produce the poorer grade, so that the eucalyptus honey is not favorably known in the markets.

The blooming period of the different species varies so that there are some in bloom at all times during the year. The blue gum, already mentioned, blooms from December until June, while the sugar gum blooms from August to November. Several species bloom during the winter months, when they are especially valuable in sustaining the bees until the time of the main honeyflows. Fig. 53 shows the eucalyptus blossoms.

At the California short course, at Davis, in 1918, M. H. Mendleson, of Ventura, spoke as follows concerning this source:

Fig. 54. Avenue of eucalyptus trees in California.

"Every winter the gum, or eucalyptus, comes into bloom. Last winter they filled two or three stories high on eucalyptus. I got 17½ cents per pound for it; previously I never could get more than 4 cents, but it was seldom that I got a surplus from this source. The most eucalyptus honey I have ever known was gathered last spring.

"The scarlet bloom **(Eucalyptus ficifolia)** is one of the greatest honey producers I have ever known. It grows from 10 to 25 feet and

has a brilliant bloom, in clusters, a beautiful sight. * * * The honey is of fine flavor, water white. You can see the nectar wave in the flower cup when you shake it. The flow sometimes lasts a month. It will stand a light frost, but not a heavy one. Our hot east winds are very hard on it, as they scorch the trees."

**EUPATORIUM,** **see Boneset.**

**EUPHORBIA, see Snow-On-the-Mountain, also Poinsettia.**

# F

**FALSE INDIGO (Amorpha fruticosa).**

False indigo is a tall shrub common to low lands along streams from

Fig. 55. Figwort, or Simpson honey plant.

Pennsplvania west to the plains. It grows in thickets and is very attractive to the bees. It is of special importance in Nebraska and Kansas. In the Arkansas Valley beekeepers report that bees get both nectar and pollen in considerable quantity, though it is seldom mentioned as a source of

surplus. Nebraska beekeepers value it because it fills in the period between fruit bloom and white clover.

**FARKLE-BERRY or SPARKLE-BERRY (Vaccinum arboreum).**

The farkle-berry or sparkle-berry is also known as winter huckleberry and tree huckleberry. It is a tall shrub 6 to 25 feet in height and common from southern Illinois and Missouri east to North Carolina and south to Texas and Florida. In parts of Arkansas it is one of the main sources of honey. W. C. Brass writes that in Lonoke County, near the center of

Fig. 56. Blossoms of fireweed.

the State, it is very abundant and takes the place of clover further north. It blooms in May and the bees roar on the sparkle-berry bushes like swarming time. It belongs to the group of plants to which the blueberries belong and most of these are good honey plants.

**FIDDLE NECK, see Phacelia.**

**FIGWORT (Scrophularia marilandica).**

Simpson honey plant, or figwort, is another widely distributed plant.

It is common in the woods from Maine to the Rocky Mountains and south to the Gulf. It is also said to occur on the Pacific Coast. The same, or a similar plant occurs in Europe and Asia.

It is a tall growing plant from 3 to 6 feet high, with numerous small branches. The stem is four angled, with rather long-pointed leaves. The flowers are very numerous and quite small, as will be seen by the picture, Fig. 55. It blooms in the late summer and is freely visited by the bees.

**FILLAREE, see Pin Clover.**

**FIREWEED or WILLOW HERB (Epilobium angustifolium).**

Fireweed is a common plant in the woodlands of the Northern States and of Canada. It is a tall herb with attractive pink blossoms on a long terminal spike, as shown in Fig. 56. It springs up following forest fires and covers the burned district with a dense growth. The blooming period is long, lasting from July till frost, as new blossoms appear as the older ones fade. It is important as a source of honey in much of eastern Canada, Minnesota, parts of Michigan, Wisconsin and on the Pacific Coast. where it is also valuable in Oregon, Washington and parts of Montana. It is gradually crowded out by other growth. A locality may yield great crops of fireweed honey for two or three years and then little surplus be gathered from it for many years. The author has visited beekeepers in Northern Michigan who count on an average of fifty pounds or more per colony, with as high as 125 pounds, in locations where fireweed was yielding. As fireweed disappears in that locality, raspberry and milkweed follow, and these are also good sources, so that the location does not suffer from the change.

Honey from fireweed is very light in color and of high quality. The late W. Z. Hutchinson, who wrote much concerning beekeeping in the forest region of northern Michigan, styled it as the whitest and finest-flavored honey with which he was acquainted.

As the timber is removed, settlement gradually clears the land, and the wild growth gives place to cultivated fields and pastures. Most of the fireweed country is also good clover territory, so that the beekeepers need not fear the development of the country.

**FLAT TOP, see Eriogonum.**
**FLEA WEED, see Blue Curls.**

**FLORIDA—Honey Plants of.**

Wild Pennyroyal in southern half of the State.

Titi, in pine swamps in northern portion, gives surplus only in west Florida.

Black Tupelo, in same territory as titi, bad weather makes the yield uncertain.

White tupelo in low swamps over west Florida; main source in swamps along the Appalachicola and Chipola rivers in Calhoun County.

Orange from the north central portion to the southern end of the peninsula.

Andromeda, central and northwestern part of the State, not important.

Gallberry or holly grows in almost all parts of Florida, but does best in north part of the State.

Saw or scrub palmetto thrives on sandy soils, doing best on moist hummocks.

Black mangrove grows on lands overflowed daily by salt water along the east coast, but yields best on east side.

Partridge pea grows in great abundance in the high pine lands of the northern half of the State.

Cabbage palmetto reaches its greatest height on the coasts and keys of the southern section. Yields heavily when it does yield.

Manchineel, on southern coast and keys as far north as Palm Beach.

Dogwood, along the keys and southern coast.

Pigeon cherry, same range as the two preceding.

In addition there are a number of such fall flowers as wild sunflowers, asters, goldenrods and thoroughwort.

Four-fifths of all the surplus honey produced in the State comes from the blossoms of nectar-producing trees or shrubs, **not** flowering plants.—E. G. Baldwin in Gleanings in Bee Culture, March and April, 1911.

**FLORIDA MAHOGANY, see Red Bay.**
**FLOWERING RASPBERRY, see Salmon Berry.**

**FRUIT BLOOM.**

All the orchard fruits are of more or less value to the beekeeper, and few differentiate between them when speaking of the sources of early nectar. In localities where a great variety of fruit is grown, the blooming period is longer than where there are large orchards of one kind. In most localities the beekeepers depend upon fruit blossoms for building up their colonies in spring, and when the weather is unfavorable at this time, feeding is often necessary to carry the bees until the next honeyflow. Apples, peaches, pears, plums, apricots and cherries all secrete nectar abundantly and, given strong colonies of bees and favorable weather, large quantities of surplus honey should be gathered from these trees. If it were possible to bring the bees through the winter as strong as in the fall, there is no estimating the amount of honey that would be gathered from the early blooming orchard fruits.

**FOG FRUIT, see Carpet grass.**
**FRASERA, see Monument Plant.**
**FURZE, see Gorse.**

# G

**GAILLARDIA, see Marigold.**

**GALLBERRY (Ilex glabra).** See also Holly.

The gallberry, in some localities better known as inkberry, is usually heard of as a honey plant only in the South. However, it occurs as far north as Nova Scotia, on the seashore, and along the coast from Massachusetts to Virginia and Florida, and west to Louisiana. It is a common shrub in the low pine barrens of the Gulf States. It is a small evergreen shrub with small, dark leaves. It is an important honey plant in southern Georgia, where it is widely distributed over the sandy lands, especially of the coastal plains. It is important, also, in the Carolinas. It grows in dense thickets and rapidly extends over newly cleared lands. Fig. 57.

> "As a honey plant perhaps it has no equal in the southeast. We have never failed to get a surplus from it, even during the most unfavorable weather conditions. It begins to bloom the first of May and continues for 24 to 28 days. During this time bees disregard other bloom, working it up to about 8 o'clock for the pollen; then the flow comes on for the remainder of the day. * * * It is a great bloomer; even the stems are rolls of bloom. * * * We have never taken off a large crop of this honey, as 147 pounds of surplus is the best crop we have ever had from one colony. The honey is a light amber color, has a heavy body, a very mild taste, and is highly flavored. The demand for this honey is so great that we cannot furnish our local markets, consequently very little is shipped from the southeast to other markets.
>
> "We have raised tons of this honey and have never seen a pound of the pure article, well ripened, that granulated.
>
> "It has been said that it is impossible to overstock a good gallberry location. We do not know that this statement is true, but we have never heard of one being overstocked. We have had bees in a location where there were 362 colonies, with the same result as with 100 colonies. Good gallberry locations are nearly numberless and large quantities of this fine honey are wasted every year in localities where there is not a bee to gather it. The gallberry should be included in the list of the best honey plants."—J. J. Wilder, Cordele, Ga. Gleanings, page 1200, September, 1907.

**GAURA.**

There are several species of gaura of wide distribution. Although frequently mentioned as honey plants, they are seldom of sufficient abundance to be important.

Scholl reports that **Gaura filiformis** occasionally yields surplus in Texas, when conditions are favorable. The red gaura is reported as of value in Colorado. (See Red Gaura.)

**GELSEMIUM, see Yellow Jasmine.**

**GEORGIA—Honey flora of.**

The earliest blooming of our spring forage plants is the alder **(alnus)**, which commences about the middle of January and lasts,. some seasons, till the middle of February. It yields little or no honey, but during its time of bloom, its pollen-laden catkins are covered with bees. The amount of pollen that this plant affords is immense; and it comes in a time when breeding should be most encouraged.

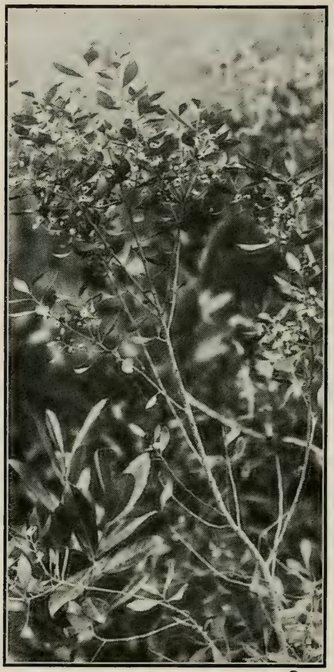


Fig. 57. Gallberry.

In some sections of the South, particularly on light, sandy soils, there may be found some yellow jasmine **(Gelsemium sempervirens).** As its flowers possess very decided toxical properties, it is not a very desirable plant to have within range of one's bees. It blooms after the alder While our native black bees are very seldom seen working upon it, the Italians, in some seasons, will work upon it quite briskly. I am inclined to think, from close observation, that it is mostly pollen they gather from it, though in some seasons it does yield some honey.

The wild plum (in some sections known as the hog plum) usually commences to bloom the last of February and lasts for two or three weeks. This is peculiarly a southern tree, and grows to great perfection nearly everywhere. Whole acres are often covered with it, forming a dense thicket, thus affording the bees rich pasture.

In March we have the peach, the apple (which continues into April), the mock orange, or evergreen wild cherry **(Cerasus carolinaensis),** the huckleberry, strawberry, and a few other plants of minor consideration. Further south they have the titi, the saw palmetto and the orange, all good forage plants.

Fig. 58. Germander, or wood sage.

The willow, wild cherry, hawthorn, blackberries, raspberries, locust, holly and tulip tree **(Liriodendron tulipifera)** bloom in April. The two latter are most valuable for honey. The holly blooms for about two weeks —the height of its flowering is about the first week in May. The tulip tree blooms for three weeks. This is the poplar tree of the south.

In May we have the black gum **(Nyssa multiflora)** and the persimmon, both excellent for forage. The blooms of these trees are dioecious, that

is, the male flower is found on one plant and the female flower on another. Bees are very seldom seen working on the female tree, while on the male bloom they work in a continuous swarm.

In May, also blooms the bay **(Magnolia glauca).** This tree flowers for at least one month, and extends into June. It affords some of our best and most abundant forage. The **Magnolia grandiflora,** linden and China berry **(Melia azedarach)** bloom also in May. The magnolia blooms for six weeks, the linden from six to ten days, and the China tree for two weeks.

Sourwood, the varnish tree **(Sterculia platanifolia),** Japan privet **(Lugustrum)** and a few other plants of less note embrace the principal forage in June.

I have now enumerated the chief honey-producing plants that go to make up our spring honey harvest. Take one season with another, our bees commence to lay up surplus about the last of April and continue until the first or middle of June. After this date but little honey is gathered from the holly, persimmon, black gum, bay and sourwood. Of course, some seasons there is considerable honey gathered from other sources. The color of the honey is usually a little dark, but of excellent flavor.

There is comparatively little forage during the summer months of July and August. The button bust **(Cephalanthus occidentalis),** sumach, **Asclepias tuberosa** (known as pleurisy root and butterfly weed), and **Yucca alnifolia** (Spanish bayonet), are the most important. The cotton plant, which generally commences to bloom about the first of July, yields largely of pollen, but very little honey. Sumach is a rich mellifluous plant, but the warm, dry atmosphere evaporates the secretion very rapidly, so that the bees can only work on it very early in the morning, while the dew is on. The Spanish bayonet plant no doubt furnishes some nectar. It generally swarms with flies, various sorts of wild bees, and now and then a few honeybees will visit it.

Bees are generally able to gather sufficient stores during July and August to keep up brood rearing and the strength of the colony until the blooming of the autumn forage.

The first to bloom of the fall pasturage is the **Chrysopsis graminifolia** of Nuttall, a perennial, composite. This plant is often taken for a species of dog fennel, but it is altogether distinct. It is indigenous to the south from Florida to North Carolina, which seems to be its northern limit. It is a yellow flowering weed that commences to bloom in August and keeps on till frost.

The goldenrod and the asters bloom till killed by frost. I esteem both these plants very highly for their honey-producing qualities. In some seasons I have hives filled with aster honey alone.—Dr. J. H. P. Brown, Augusta, Ga. American Bee Journal, Page 500, 1880.

**GERMANDER or WOOD SAGE (Teucrium canadense).**

The germander, also known as wood sage, is found in open woodlands and thickets from Nova Scotia to Nebraska, and south to Florida and Texas. It is common in the Central States, and is much sought by the

bees. The blooming period is long. In 1915 the bees were working on this plant in the writer's garden for nearly two months. Apparently this plant does not secrete nectar very freely, yet it is an excellent plant to keep the bees at work when they might otherwise be robbing. The writer does not recall ever having seen a locality where it was sufficiently abundant to amount to very much by itself, though it is a valuable addition to the other honey-producing flora. Fig. 58 shows the blossoms and leaves, which bear some resemblance to catnip.

Fig. 59. *Solidago squarrosa.*

**GIANT HYSSOP (Agastache nepetoides).**

Giant hyssop is a tall perennial herb with flowers crowded on a terminal spike, flowering in summer. It is common in woodland borders from New England to Minnesota and south to North Carolina and Texas. Lovell lists it as blooming about six weeks and much visited by honeybees. Probably nowhere important.

**GILIA.**

Jepson lists 18 species of gilia as common to California. The late Prof. A. J. Cook, writing of gilia in the American Bee Journal stated that all the gilias are good honey plants. He mentioned **Gilia capitata** as the source of quantities of sky-blue pollen. He mentions the fact that several

species yield pollen of a blue color. It is probably a source of minor importance, since it is seldom mentioned except incidentally in the literature.

**GOLDEN GLOW, see Coneflower.**

**GOLDEN HONEY PLANT (Actinomeris squarrosa).**

The golden honey plant is common from New York to Michigan and Nebraska, and southward to the Gulf States. This plant is closely related to the crownbeard and is sometimes classified as a verbesina. It grows in rich bottom lands and in the borders of woods and fields, reaching a height of 4 to 8 feet. The yellow flowers are very attractive to the bees and, where sufficiently common, are a valuable source of nectar.

Fig. 60. *Solidago puberula.*

**GOLDENROD (Solidago).**

Of the eighty species of goldenrod all but three or four belong to North America. It is one of our most widely distributed native plants. Some species seem adapted to nearly every condition from Canada to Mexico and from the Atlantic Coast to California. There is a wide difference, however, in the value of the different species to the beekeeper, and it is no easy task to get reliable information regarding the range of conditions under which it secretes nectar abundantly, nor is there much recorded information concerning the particular species which are most

valuable for this purpose. It is a well-known fact that the secretion of nectar with any plant is greatly influenced by soil and climatic conditions. Some of our most valuable honey plants have been reported as producing no nectar when introduced into Australia.

It is very probable that when we have studied the matter carefully we will find that the same species of goldenrod varies as much in its nectar secretion under different conditions as we know to be the case with alfalfa.

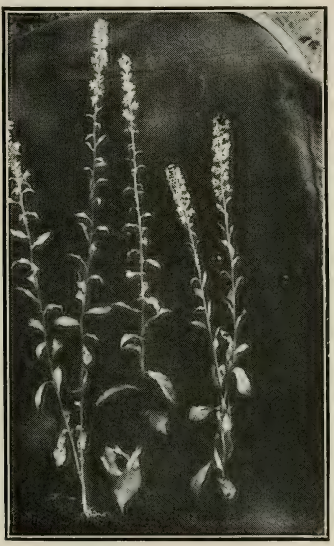


Fig. 61. *Solidago hispida.*

Lovell is of the opinion that all species of goldenrods secrete nectar in some localities. This is quite probable, although there is very little honey from goldenrod in Iowa from any species. Along the upper Mississippi, in the northeastern counties, a few beekeepers report honey from goldenrod. In other sections of Iowa beekeepers report that they have never seen a bee on the plant. Dr. L. H. Pammel, botanist at the State Experiment Station, reports nine species of goldenrods common to that State. He lists **S. serotina, S. canadensis** and **S. graminifolia** as furnishing some honey here. If Lovell is right about all yielding nectar under some conditions, then all are of interest to the beekeeper, and it remains a question of learning the conditions under which each species develops most favorably. If all do not yield nectar, it is important that we learn to

distinguish between the species which are valuable honey plants and those which are troublesome weeds.

Richter lists only two species of this plant as important in California. The western goldenrod **(S. occidentalis),** he mentions as common in wet places such as marshes and river banks, from August to October, yielding

Fig. 62. Bushy goldenrod (*Solidago graminifolia*), a fine honey plant in New England.

an amber honey. **S. californica,** the common goldenrod of the coast, he describes as common on dry plains and hillsides or mountains throughout the State, from August to December. He lists it as a fair honey plant.

Scholl reports goldenrods as common to all parts of Texas, and states that the honey yield is good in favorable seasons when it is not too dry. He reports a long season, from April to November, but gives no list of the species furnishing nectar in that region.

Sladen reports finding eleven species of goldenrods about Ottawa.

He finds that individually the **canadensis** group (Fig. 64) produce comparatively little nectar, but their great abundance makes them important collectively.

Sladen also notes the variation of the plant under different conditions

Fig. 63. Tall, hairy goldenrod (*Solidago rugosa*), one of the best for honey.

and says that the nature of the land determines the presence and abundance of the best species. He reports that in the wet lands of Charlotte County, N. B., especially in the Honeydale district, they, together with asters, furnish the principal source of nectar, and that they are valuable generally as a source of surplus in coastal districts of New Brunswick and Nova Scotia. The same is said of eastern Manitoba. He places the yield at from 50 to 80 pounds per colony in localities where the best

species of goldenrod and asters abound. The honey is usually of good quality, ranging in color in the different districts from white to dark amber. That gathered in swampy districts is usually bright golden. Evidently goldenrod honey is seldom stored separate from aster in localities from which these reports are made.

Mr. Sladen describes three types of locations in which the plants may be found in Canada:

Fig. 64. Common or Canada goldenrod (*Solidago canadensis*).

1. Open swamp or bog, where **S. uglinosa** and **S. rugosa** are found. The former begins blooming in August, while the latter blooms until mid-September, so that there is more than a month of flow from these plants. Although the bogs are independent of rain during the honey flow, fine weather and moderate warmth are necessary to a crop.

2. Sandy or gravelly barrens or plains. On the coast, as well as inland, on such lands are found **S. puberula (Fig.** 60), while inland are to be

found in addition, **S. squarrosa** (Fig. 59) and the less important **S. hispida** (Fig. 61). Good rains in early August, followed by fine and warm weather, bring best results.

3. A restricted area centering in Cumberland County, Nova Scotia, in which **S. Graminifolia** is a troublesome weed (Fig 62.)

He further reports that the roadside goldenrods of old Ontario are not heavy producers of honey under ordinary conditions.

Fig. 65. Early goldenrod (*Solidago juncea.*

In an article on the Honey Flora of New England, which appeared in the April, 1916, American Bee Journal, Lovell states as follows:

> "If I were compelled to stake the existence of bee culture in New England on a single genus of plants I should select the goldenrods. There are many species, and they all yield nectar and pollen. They begin to bloom in midsummer and continue to bloom in October. They are very common and there are species adapted to the seashore, the fields, the rocks and the woods. I have never known the flow of nectar to fail, and a great quantity of heavy, yellow honey is stored annually."

Mr. Lovell has kindly sent me his field notes on these plants. There is a large amount of interesting information which space will not permit inserting here. The notes include the study of six species, all of which produce some nectar in Maine. He describes the tall, hairy goldenrod **S. rugosa** (Fig. 63) as the latest to blossom and the most valuable as a honey plant. It is found in damp thickets and on moist land. While in bloom the bees work it very diligently and the honey is stored rapidly. The apiary is filled with a sour odor, which, in the evening, is noticeable at a distance.

Goldenrod honey, according to him, is deep golden yellow in color, thick and heavy, with a more decided flavor than white clover honey. When extracted it granulates in a month or two, but the bees winter on it perfectly.

Next in importance he places the bushy goldenrod **(S. graminifolia)** (Fig. 62). This is common in fields, open woodlands and hedgerows. The odor is faint, but the nectar is clearly visible in the flowers. He reports as many as six honeybees at work at one time on a single flower cluster. It will be noted that this is one of the species which Doctor Pammel mentions as yielding nectar in Iowa. Sladen also cites it as important in Canada.

Graenicher collected 135 different species of insects on this species in Wisconsin.

The cream-colored goldenrod, sometimes called white goldenrod **(S. bicolor),** is of special interest because of the fact that it is the only one of the group which is not yellow in color. Although it produces nectar, I can find no record which indicates that it is of much importance as a honey plant anywhere. Lovell says that it is of little value in Maine.

The early goldenrod **(S. juncea)** (Fig. 65), is the first to bloom in Maine and is very abundant in old fields. The bees visit it freely, but apparently do not get much honey from it.

Graenicher states that he has collected 182 different species of insects on this plant, in Wisconsin, which indicates the presence of considerable nectar in that locality.

**General Reports**

In searching through the beekeeping literature for reports on honey from goldenrods I seldom find the particular species mentioned.. There are numerous reports of honey from goldenrod, but this is as far as the report usually goes.

> "Two colonies of bees taken to a sandy plain forty miles north of Ottawa, August 25, each gathered, in three weeks, about 40 pounds of surplus honey from **S. puberula** and **S. squarrosa.** It is estimated that at least three-fourths of the honey came from **S. puberula,** which was much more abundant than **S. squarrosa.** The honey is of a light color and the flavor and aroma are pleasant and distinctly suggestive of goldenrod."—Sladen, in 36th report, Ontario, B. K. A.
>
> "You ought to see the bees work on it. They store lots of honey from it. Last year I had five or six nuclei which did not have any stores at all on the first of September, but when I went to feed them for winter I found they had twenty pounds of nice honey gathered from goldenrod. They all came through the winter in good condition." —Kentucky. Gleanings in Bee Culture.
>
> "The goldenrod is one of our main sources for a fall flow. The bees usually fill one or more supers from it."—Connecticut. Gleanings in Bee Culture.
>
> "My bees have gathered lots of goldenrod honey this fall, and at times the odor has been offensive to the neighbors."—Vermont. Gleanings in Bee Culture.
>
> "Smartweed and goldenrod grow here, but do not furnish any honey. Never saw a bee on them."—Iowa. American Bee Journal.

**GOOSEBERRY (Grossularia).**

Gooseberries are native American shrubs with stems covered with sharp thorns or spines. There are several species widely distributed. They are very attractive to the bees and are of some importance, especially where grown in large plantings for market. The wild varieties are common in open woodlands in nearly every section of the country.

**GOLDEN WATTLE, see Acacia.**
**GOPHER WOOD, see Yellow Wood.**

**GORSE or FURZE (Ulex europaeus).**

Figure 66 is a spiny evergreen shrub with yellow flowers that is common in Europe, where it is said to be used to some extent for fuel and fodder. There are few references to it in this country. In California it is said to bloom during all seasons, although much more freely in spring. Richter reports it as a very good honey plant on the hills of Marin County.

**GRANJENO, see Hackberry.**

**GRAPE (Vitis).**

The grape family is represented by wild species in all parts of the temperate regions of both hemispheres, and by cultivated species in nearly all parts of the world. There are about thirty species of wild grapes, and where sufficiently common they are very attractive to the bees. In many localities cultivated grapes are grown in large acreage. The nectar yield is not as abundant as with many plants, but is of some value where the vines are largely grown. Quantities of pollen are gathered from this source. At times honeydew is gathered from the leaves.

Scholl lists the mountain grape **(Vitis monticola)** as giving a fairly good honey yield and furnishing pollen for early brood rearing. Richter lists the California wild grape as yielding some honey.

### Bees and Grapes

Of the disagreements between fruit growers and beekeepers, probably those growing out of the tendency of the bees to suck the juice from cracked grapes have been most serious. Many unfortunate misunderstandings have resulted from such circumstances, though the injury was as great to the beekeeper as to the fruit grower, in many cases.

This condition arises from a combination of circumstances which does not often occur in the average locality. In the first place, the bees do not seek the grapes when there is plenty of nectar in the field, and, beside, they are unable to reach the juice unless the grape has first cracked open through unfavorable weather conditions or has been injured by birds, wasps, or other agency. Grape growers, seeing the bees at work in the vineyards, have often accused the bees of injury to the fruit. The fact of the matter is that the bee is unable to puncture the fruit, and only sucks

the juice from such fruits as have already been broken open and are already damaged.

Wet weather often causes ripening grapes to crack open to such an extent that they would be of little value, even though no insect touched

Fig. 66. Gorse or furze.

them thereafter. In dry weather, also, birds sometimes pierce the skins, apparently in search of moisture from lack of an available water supply. Some authorities say that at such times a liberal supply of water in open vessels near the vineyard will stop the injury from the birds. The English sparrow is accused of injury to grapes to a larger extent than most birds.

The grape-berry moth infests a great many grapes in some localities. In fact, entomologists state that in some localities as high as 50 per cent of the crop is injured by this insect alone. The fact that the honeybee sucks the juice from the berries which have already been opened by wet weather, grape-berry moths or other causes, does not greatly injure the grape grower, for such fruit is of little value.

The writer has visited the raisin districts of Southern California and discussed this condition with the raisin growers. The accompanying pic

ture (Fig. 67) shows a bunch of raisin grapes that had been sucked dry by the bees. In that locality rains are very infrequent when the raisins are being dried. They are spread out in thin layers in crates and the crates left in the sun, or piled up one above another, till fully dry. Previous to the writer's visit there had been an unexpected rain, and some raisins were allowed to get wet. As a result they cracked open, and there being just then no available nectar for the bees, they swarmed over the

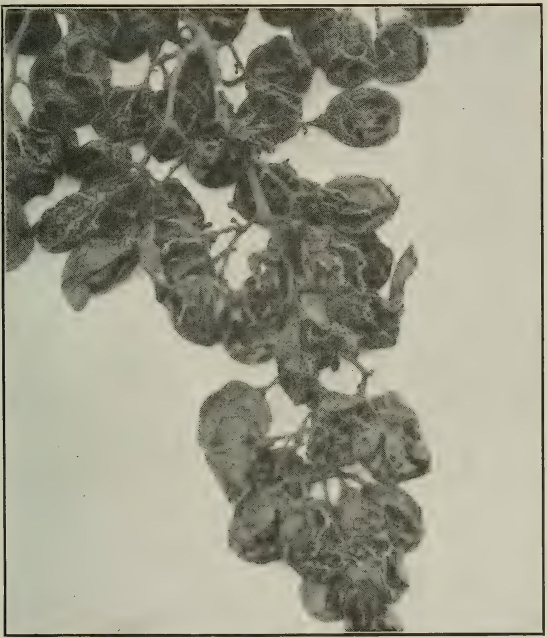


Fig. 67. Raisin grapes sucked dry by bees after the skins have been broken by rain.

raisins and sucked them dry, as shown in the picture. The grower admitted, however, that the raisins had been so badly damaged by the rain as to be of little value.

The thing which few grape growers seem to understand, is that it is unfortunate, indeed, for the beekeeper in northern regions, whose bees fill their hives with this grape juice. In the north there are long periods during the long winter months when the bees are unable to leave the hive. Since the bee is only able to void her excrement while on the wing, there is a large accumulation of feces during such long confinement. If the bees have only the best white honey for food the tax is severe at best. When

they have fruit juice, honeydew or other food containing a large amount of waste matter, the intestines become so distended that the bees die for lack of opportunity of a cleansing flight. Grape growers will in many cases be surprised to learn that thousands of bees die from having filled their combs with fruit juice instead of honey. Of course, the wide-awake beekeeper will remove this material from the hive and give them good honey or sugar syrup instead, if it is possible to do so. This, however, involves a large amount of labor, and the gathering of the juice from the grapes, instead of being an advantage to the beekeeper, is a serious inconvenience to him. In southern California, where there is no winter confinement, there is no particular injury to the bees, other than spoiling the grade of any honey with which it may happen to be mixed.

The late Charles Dadant, who was one of the most widely known beekeepers of the past generation, on one occasion had a difficulty with some growers who could not be made to understand that he was not getting rich at the expense of his neighbors, when his bees were attracted to their grapes. He decided that the only way to convince them that the interests of the beekeeper and the grape grower were mutual, was to grow the largest acreage of grapes in the neighborhood. This he proceeded to do, and after he became the largest grower of grapes in his community there was no longer any criticism, for they could readily see that he had too much at stake in his grapes to permit him to be prejudiced in favor of the bees.

That bees are valuable in securing the fertilization of the blossoms of some varieties of grapes, there is little question.

**GRAPE FRUIT (Citrus decumana).**

Nowhere in America is the grape fruit cultivated in such extensive orchards as is the case with the orange and lemon. It is recognized as a valuable source of honey, but not equal to either of the foregoing. It is an evergreen tree similar in habit to the other citrus fruits, and the area devoted to its cultivation is being extended in various districts.

Bees are very efficient pollenizers of grape fruit blossoms. The Atwood grape fruit ranch, one of the largest in Florida, is provided with two apiaries, brought there at the request of the manager of the ranch. They hold that the trees bear a larger number of fruits since the bees have been kept in close proximity.

**GRASSES.**

There are many grasses which are attractive to the bees for pollen. Timothy or herd's grass produces pollen in great abundance and the bees are often observed gathering it. Occasionally some honeydew may be gathered from the grasses also, but no honey.

**GREASEWOOD (Adenostoma fasciculatum). CHAMISE.**

Greasewood is an evergreen bush or shrub of spreading habit about two to ten feet in height. Jepson describes it as "the most abundant and characteristic bush of the higher coast ranges and Sierra Nevada, commonly gregarious and occupying, to the exclusion of other shrubs, exten-

sive and especially abrupt slopes and mountain ridges. It often forms a distinct zone between the foothills and the yellow pine belt."

Richter lists it as eagerly sought by the bees in several California counties, though no mention is made of it as a source of surplus honey.

**GREENBRIAR (Smilax).**

There are several species of greenbriar, some of which are common from Canada to Texas. They grow along watercourses and in open woodlands and the stems are covered with stiff and hard thorns. Scholl lists one species as yielding nectar in Texas. The author found reports to the effect that bees gather honey from greenbriar in McLennan County, Texas. At the same time it was stated that no honey was gathered from it in other nearby sections. The plant seems to be of doubtful value and is not sufficiently abundant to be important.

**GRINDELIA, see Gum Weed.**
**GROUNDSEL, see Butterweed.**
**GROUND LAUREL, see Arbutus.**
**GUAIACUM, see Soapbush.**
**GUAYACAN, see Soapbush.**
**GUM, see Tupelo, also Eucalyptus.**

**GUM-ELASTIC or SHITTIM.WOOD (Bumelia lanuginosa rigida).**

Gum-elastic is the common name in south Texas for the Arizona buckthorn, a small tree occurring from western Texas to Arizona. It has a short stem with stiff and very spiny branches. It is frequently mentioned as a source of honey in southern Texas.

There are reports to the effect that it sometimes yields a surplus along the Trinity River and that the honey often sours in the combs after being sealed.

**GUM TREE, see Eucalyptus, also Tupelo.**

**GUM WEED or GUM PLANT (Grindelia squarrosa).**

The gum weed, also called rosin weed, is a common plant from Wyoming and Colorado south to Arizona, New Mexico and Texas. It occurs sparingly eastward to Minnesota and Missouri. The bright yellow flowers exude a milky resinous gum, which gives rise to its name, "gum weed." It is also widely known as rosin weed (Fig. 68). It blooms in August and is much sought by the bees. The honey is yellow and of inferior flavor. It is often mixed with light honey in the super and the grade spoiled as a result. In Colorado it is well known by the name of "rosin weed." There the comb-honey producers complain that it often spoils the quality of their product through being mixed with the honey from alfalfa and sweet clover. Honey from gum weed candies very quickly, so quickly in fact, that Colorado beekeepers say that the bees have to hurry home with the load to prevent it becoming candied in their sacs. Comb honey which candies cannot readily be restored, hence in localities where gum weed

is abundant the beekeeper may find it to his advantage to produce extracted honey. Even this does not solve the problem entirely, since the gum weed honey candies in the combs so readily as to make it difficult to extract. There are few reports of large surplus from this source. In most cases it is mixed with other honey and only in such quantity as to make it rather a nuisance than otherwise. The tendency to candy in the combs makes it undesirable for winter stores.

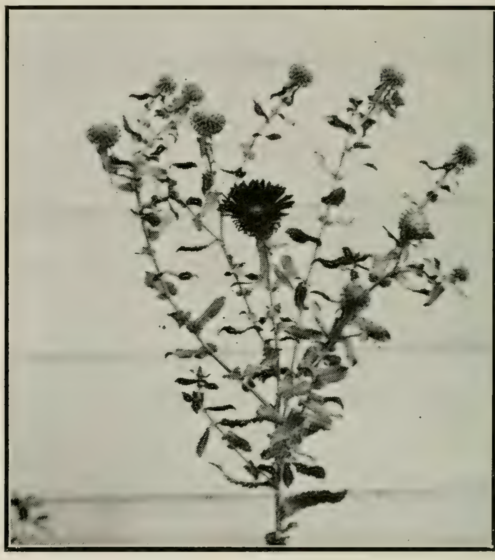


Fig. 68. Gumweed, or rosin weed, of the Great Plains.

# H

**HACKBERRY (Celtis).**

The hackberries are an important group of trees. There are about sixty species of trees and shrubs which are widely distributed in both the old world and America. There are about half a dozen species known to America, and of these, three are much valued by the beekeepers of Texas. The author has never known the bees to find nectar on the hackberry in the north, and was surprised at the many reports of honey from hackberry received from Texas beekeepers while visiting that State.

The granjeno **(Celtis pallida)** is a shrub common to the mesas and foothills of western and southern Texas. E. G. LeStourgeon, of San Antonio ,regards it as the best of all the hackberries, blooming after every good rain. The honey is pale amber in color and of good quality. He reports that honey from all hackberries is of good quality. When the author visited at Brownsville, in February, 1918, the bees were working on the above species very freely at that time.

The Southern hackberry or sugarberry **(Celtis mississippiensis)** is common all over the Gulf and South Atlantic States from Kentucky and southern Illinois to Florida, Arkansas and central Texas. LeStourgeon reports that this species blooms after the others, in March and April, and that while it yields some honey, it is not as good as the others.

The Northern hackberry **(Celtis occidentalis)** is also known as sugarberry, and is common from New England and Ontario to Minnesota, Nebraska, Colorado and southward to Georgia and Texas. The author has never heard a report of bees visiting this species for nectar in the North, but it is reported also as a source of honey in Texas.

**HAU TREE (Paritium tiliacium).**

"The hau tree of Hawaii has nectaries on its leaves which secrete a honeydew. These are located on the veins of the leaves near the stem, and are one, two, three or five in number. Small drops of honeydew may frequently be seen on these spots. It is interesting to note that these extra-floral nectaries are present on the outside of the calyx of the flowers. There is apparently no true floral nectary. The hau tree is used extensively as a hedge, and grows from 20 to 30 feet high. It is doubtful whether this is the source of any great percentage of the honeydew honey."—E. F. Phillips, Bul. 75, Part 5, Bureau of Entomology.

**HAW, see Hawthorne.**

**HAWAII—Honey Flora of.**

The algarroba tree **(Prosopis juliflora)** is either the same species as,

or very closely related to, the mesquite of the southwest. On the islands it grows to the size of a tree, as is also the case in Mexico. In Texas it is generally very much smaller. In 1908 the tree came into bloom about the 1st of March, the time varying considerably in different localities on the islands. It usually blooms until August, and this very long blooming period adds greatly to its value to the beekeepers.

The following list of honey plants, other than algarroba, is furnished by Mr. D. L. Van Dine, Entomologist of the Hawaii Agricultural Experiment Station. Mr. Van Dine has studied the honey sources of the islands very thoroughly:

### Forest Trees

"Texas mesquite **(Prosopis glandulosa).** Growing in dooryard of Mr. C. C. Conradt, Pukoo, Island of Molokai. Seeds under propagation at Hawaii Agricultural Experiment Station. Introduced by Mr. Conrad from Texas several years ago.

Ohia lehua **(Metrodsideros polymorpha).** Produces a particularly high grade of honey. Locations for apiaries, as a rule, somewhat inaccessible. One location on the island of Molokai is within the ohia lehua belt.

Various species of Acacia (black wattle, koa, etc.) Mountainous districts.

Various species of eucalyptus. Mountainous districts.

Wiliwili **(Erythrina monosperma).** In gulches on Molokai and Oahu.

Rose-apple **(Eugenia jambos).**

Mamani **(Sophora chrysophylla).** Found in higher forest belts.

Catalpa **(Catalpa speciosa** and **C. bignonioides).** Introduced by Mr. Jared G. Smith, April, 1902, from the Missouri Botanical Gardens.

Logwood **(Haematoxylon campechianum).** Found in dooryards. Two trees are growing in the grounds of Oahu College and one in the grounds of Lunalilo Home, Honolulu. Seeds under propagation at Hawaii Agricultural Experiment Station. The honey produced by bees from this tree is reported to be the finest table honey in the world.

The black mangrove of Florida. Introduced by Mr. Jared G. Smith from Southern Florida, for the purpose of preventing the mud flats from washing along the coast of Molokai, near Kaunakakai. The introduction was made several years ago and the trees are now well established at the above-mentioned place. The tree is a valuable honey plant.

### Fruit Trees

Various species of citrous (orange, lemon, lime, etc.)

Avocado **(Persea gratissima).**

Banana **(Musa spp).**

Guvy **(Psidium spp).**

Loquat **(Eriobotrya japonica).**

Tamarind **(Tamarindus indica).**

### Pasture Plants

California burr-clover **(Medicago denticulata).** Introduced on Maul in 1882 by Mr. C. R. Blacow. Now found generally on the ranches of the islands.

Carpet grass **(Lippia repens).** Growing on grounds of Hawaii Agricultural Experiment Station.

Alfilaria or filaree **(Erodium cicutarium** and **E. moschatum).**

Seeds introduced in California hay. Established on upland pastures on Hawaii and Molokai.

White clover **(Trifolium repens).** Found on Haleakala and Makawao pastures, Maui.

**Crop Plants**

Sisal **(Agave sisalana).**

Various species of curcurbits (melons, squashes, pumpkins, cucumbers, etc.)

**Forage Plants.**

Alfalfa, several varieties.

Lupins, blue and yellow. Occasionally used as green manure plants on sugar plantations.

Tangier pea **(Lathyrus tingitanus).** Growing at Haiku, Maui.

Sanfoin **(Onobrychus sativa).** A forage plant introduced by Mr. Jared G. Smith in 1904. Seed distributed to ranches.

**Ornamental Plants**

Palms, particularly the royal and cocoanut.

Poppy, a horticultural form of **Romneya coulteri,** found in gardens in Honolulu.

Chinese inkberry **(Sestrum diurnum).**

**Thevitia nereifolia).**

Vines **(Ipomæa supp).**

**Weeds**

Lantana, two species. .

California Sages **(Artemisia).** Introduced by Hawaiian Beekeepers' Association in 1907. Not as yet established. Suitable for waste, arid lands. The most important honey plant in California. Valuable as a forage plant.

Ilima **(Sida spp).**

Oi **(Verbena bonariensis).**

Pill grass **(Heteropogon contortus).**

Spanish needle (lauki) **(Bidens pilosa).**

Puakala **(Argemone mexicana).**

Alii **(Dodonæa viscosa** var. **spathulata).**

Hila hila (undetermined).

Other weeds are **Waltheria americana, Ipomæa pes-capræ** (vine along seacoast), and **Malvastrum tricuspidatum.**

**Other Sources of Honey**

Hawaii is peculiar in that most of the honey produced is from some source other than flowers. Two-thirds of the honey shipped annually from the islands is largely or entirely honeydew honey. By far the greater part of this comes from the exudations of the sugar cane leafhopper.—E. F. Phillips, Bul. 75, Part 5, Bureau of Entomology.

**HAWTHORN (Crataegus).**

Figure 69 pictures a hawthorn in full bloom. The picture does not do justice to the masses of white flowers with which the tree was covered. This is an eastern species **(Crataegus punctata),** which occurs from Quebec to Ontario and south to Georgia. It was about the middle of June when this picture was taken and the bees were working on these trees everywhere we went. Clover had not begun to yield to any extent and the thorn was a great boost to the bees wherever it was plentiful.

There are many different species of hawthorn, or haw, some of which occur in Europe and Asia, as well as in North America. On this continent some species are common from Canada to Mexico and west to the treeless

Fig. 69. The hawthorn blooms abundantly and yields nectar freely.

plains. Scholl reports the white thorn **(Crataegus spathulata)** as valuable for both honey and pollen in Texas, where it blooms in April. There are about 25 species of these trees within the United States, and all may be regarded as valuable sources of honey where they are sufficiently plentiful.

In general, they may be regarded as similar to the tree fruits in quality and quantity of nectar. Five species are known to occur in Ontario, where they are regarded as important honey plants.

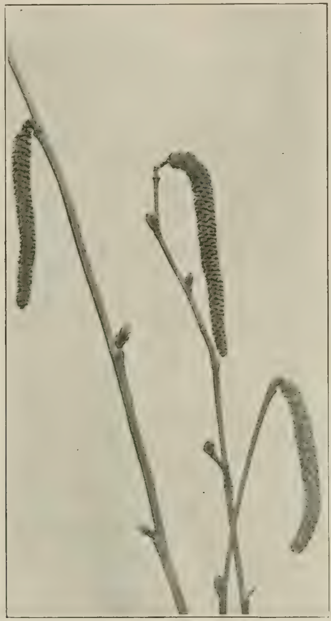


Fig. 70. The hazelnut is the source of some pollen.

**HAZELNUT (Corylus americana).**

The hazelnut is a slender growing shrub common in the borders of woodlands of the most of the temperate North America. It yields some pollen and is valuable where there is a scarcity of early pollen-bearing plants. The figure shows the male blossoms, which are more conspicuous than the fertile ones.

**HEARTSEASE (Polygonum).**

We now come to another large family with a variety of names. In some localities one name will apply, while in another the plant will be known by an entirely different one. Smartweed, knotweed, doorweed, persicaria, lady's thumb, water pepper, heartsease and several other names are applied to these plants. They are widely distributed, covering practically all of the United States and Canada, as well as much of Europe and

Asia. **P. persicara,** or lady's thumb, the large-flowered kind, is most often called heartsease, and is also said to be the best honey producer. It is an introduced species, coming from Europe, and is still widely scattered through the sale of clover seed, the seed of this plant being commonly mixed with red clover seed.

The honey gathered from these plants varies greatly, both in quantity and quality. Some species do not seem to yield at all, at least not regularly, while others produce large quantities of nectar. The blooming

Fig. 71. Two species of heartsease or smartweed.

period in the North is from midsummer until frost, and occasionally large yields are reported, an average of 200 pounds per colony not being the highest on record, from this source alone. Sometimes honey from these plants is of very good quality, while from other species it is very dark and of inferior grade. The better grade of honey is sometimes designated as heartsease honey, while the poorer grade is called smartweed honey.

These plants grow in moist fields everywhere, and frequently come up

in grain fields and stubbles late in summer, after cultivation has ceased, thus offering plentiful forage for the bees, in fields where otherwise they would find nothing.

**HEATHER (Calluna vulgaris).**

Heather is a very important honey plant in Europe, but occurs in few places in America. Gray's botany lists it at the following places: "Low grounds, Massachusetts at Tewksbury and West Andover; Maine, at Cape

Fig. 72. Blossoms of the heather.

Elizabeth; also Nova Scotia; Cape Breton; New Foundland, etc." It may in time become locally important in Eastern America, though it is doubtful whether it be so at present.

Writing in Gleanings, D. M. MacDonald has the following comments on heather honey in Scotland:

> "The product of heather is of a rich amber color, bright and sparkling, rather than dull and shady. It has a pronounced flavor, delicious to the palate when one has acquired a liking for it. The aroma is pungent and penetrating, making itself manifest in a room where heather honey is kept in a closed cupboard. Its consistency is so remarkable that it will not leave the comb by any amount of centrifugal force used in the extractor, and when desired in the liquid form, the combs have to be melted and pressed by heavy screw power in a specially constructed press. Most beekeepers in heather districts, therefore, work for sections only; but it pays well to press all defec-

tive combs preserved for the purpose, and thus renew the wax of the brood area periodically. On account of the profusion of the bloom, the flow is at times extraordinarily abundant; but as the lateness of the season frequently causes unfavorable weather conditions, the crop is an uncertain one.

Fig. 73. Hedge nettle.
(Photographed by Prof. Hottes.)

"Heather honey sells for about double the price obtained for any other kind in this country. While a great part of the flower, clover and lime honey brings the apiarist only 18 cents per pound, heather frequently fetches him 36 cents. While, too, the other kind drags on

the market, heather honey sells readily and is often disposed of before it comes off the hives. Retail prices in warehouses in Edinburg and London are often as high as 48 to 60 cents per section."—October 1, 1910.

In November, 1913, C. P. Dadant, editor of the American Bee Journal, wrote as follows concerning heather in southern France, seen by him during his visit to Europe in 1913:

"I had often heard of the 'Landes' of Gascony, but thought them low, sandy plains. They are rolling hills instead, and extend for scores of miles along the Gulf of Gascony.

"The growth upon the 'Landes' is confined to numerous ferns, scrubby pines and cork oaks, with a very thick undergrowth of heather. Just now the heather is in its fullest bloom (September), and there are perhaps 20 different varieties, ranging from the palest pink to almost red and deep yellow in color. It is a mass of flowers upon which the bees work from June until frost, which comes very late, usually not before November. So we may readily call this the eldorado of beekeeping. There is only one dark side to the picture—the heather honey is dark in color, a deep amber, strong in flavor and almost impossible to extract with the honey extractor. Here I ascertained positively what I already suspected, that when speaking of nectar containing 75 per cent of water, we should confine ourselves to the nectar of our moist prairies. I am told that much of the nectar harvested from heather, in this dry, sandy soil, is too thick at the end of the first day to be thrown out readily."

**HEATHER, see also Eriogonum.**

**HEDGE NETTLE or WOUNDWORT (Stachys).**

The hedge nettles are herbs with flowers in terminal spikes as shown in Fig. 73. The corollas are two-lipped and **Stachys agraria** is commonly known as "mint" in the Rio Grande Valley. At several places in the extreme south part of Texas the author heard reports of surplus honey from this source and from related species.

Richter lists three species, **Stachys ajugoides,** the white hedge nettle, **Stachys albens,** and **Stachys bullata,** as yielding honey in California.

Other species are common to the Eastern States from Ontario south to the Gulf States.

**HELENIUM, see Bitterweed.**
**HELIANTHUS, see Sunflower.**

**HELIOTROPE (Heliotropium).**

The cultivated heliotrope and also the wild heliotrope **(Heliotropium curassavicum)** are listed by Richter as sources of honey in California. There is also an occasional mention of heliotrope as a source of nectar in the bee magazines, but probably it is not important.

**HERCULES CLUB or ANGELICA TREE (Aralia spinosa).**

Hercules club or angelica tree is a shrub or small tree common to damp borders of the woods and river banks from Virginia to Missouri, and south to Florida and Louisiana. The flowers are white and appear in

early summer. It is reported as yielding nectar abundantly, though not often as a source of surplus.

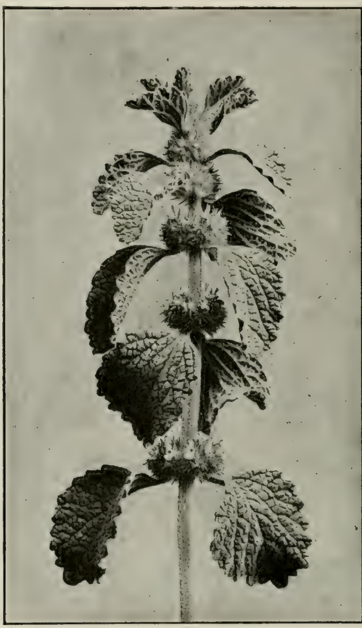


Fig. 74. Hoarhound.

**HERON'S BILL, see Pin Clover.**
**HETEROMELES, see Christmas Berry.**

**HICKORY (Hicoria).**

The hickories are an important group of forest trees of wide distribution. They are of special interest to the beekeepers as sources of large amounts of honeydew from aphis, which are frequenty to be found on the leaves. These trees are important for pollen, also, in many localities.

**HIMALAYA BERRY, see Blackberry.**

**HOARHOUND (Marrubium vulgare).**

Hoarhound (Fig. 74) is a well-known plant, introduced from Europe, which has become naturalized from Canada south to the Gulf of Mexico. The plant is perennial, flowering from July to September. It occurs in

waste places, along roadsides and near dwellings over a wide scope of country.

It is one of the chief sources of nectar in places in the Arkansas Valley in Kansas, also in portions of Texas. The honey is dark amber and strong in flavor. Beekeepers report it as important at Seguin, Texas. Reports of honey from this source come from widely separated localities from the Eastern States to California.

Richter lists it as blooming in May and June in southern California, but at the usual period further north. He reports that Ventura and Los Angeles Counties produce hoarhound in considerable quantities, but that it is regarded with disfavor in the sage districts because a small quantity of this honey, mixed with the sage, impairs the color and flavor of the latter.

Wherever plentiful, hoarhound may be expected to yield some honey, and in many places it yields surplus in quantity. Although not of the best quality, it is still an important honey plant.

**HOARY VERBENA, see Vervain.**
**HOG GUM, see Poisonwood.**

### HOLLY (Ilex).

The holly family is a large one, with representatives in Europe, Asia and South America, as well as North America. There are more than a dozen species on this continent, most of them common to the Southeastern States. The common holly **(Ilex opaca)** is found from Massachusetts and New York south to Florida and west to Arkansas and Texas. It is reported as a valuable source of nectar in most of the Southern States. The Myrtle-leaf dahoon holly **(Ilex myrtifolia)** occurs from North Carolina to Florida and western Louisiana.

The holly trees bloom in May, and in Alabama, Georgia and Mississippi are reported as yielding rapidly for a short period of time, usually three to ten days.

The deciduous holly or privet **(Ilex decidua),** of the Southeast, is known in Texas as possum haw or bearberry. It ranges from southern Virginia to Florida and west to Missouri and Texas. It blooms early and is reported as yielding well for a short period.

The yaupon **(Ilex caroliniana)** Trelease, is frequently reported as a source of honey by Texas beekeepers, though Scholl lists it as unimportant.

The gallberry **(Ilex glabra)** is probably the most important source of honey of the group, especially in the Gulf region. (See Gallberry).

### HOLLYHOCK (Althaea rosea).

The hollyhock is one of the oldest cultivated garden flowers. It is a native of China and is to be found in every garden of old fashioned flowers. Wherever found, the bees seek it eagerly, and apparently it secretes nectar freely.

**HONEYDEW.**

Such material as the bees may store as honey, which is not secured from the nectaries of plants, is usually spoken of as honeydew. There are numerous exudations of plants which attract the bees and which can hardly be regarded as nectar, to which the term honeydew may well be applied.

The main source of honeydew, however, is from insects rather than from plants. Aphids, scale insects and leaf hoppers yield this sugar in great abundance. These sucking insects are often found on various trees or plants in large colonies, feeding on the sap; while bees and ants gather to feed upon their excretions. At times aphids are so abundant that they eject honeydew in such quantity as to cover the leaves on lower levels with the sticky substance, till the drops give the impression that it might have rained. The bees gather honeydew readily in the absence of a natural honeyflow, carry it to the hive and seal it in their combs the same as honey.

The quality of most honeydew is inferior and it brings a low price in the markets, being in most demand for baking purposes. Since there is a much larger percentage of gums in honeydew than in honey it makes a poor food for winter stores. The excess matter clogs the intestines of the bees, and where they are confined on such stores for long periods without an opportunity for cleansing flight, a heavy mortality results.

There are hundreds of references to honeydew in the beekeeping literature. A few are given here to indicate the extent to which bees gather this insect product:

> "The most copious flow of honeydew I ever saw was in 1897. It was from the pine. In early morning and late in the evening it could be seen dripping from the leaves, till all the leaves and even the bare ground beneath them were covered with the nectar. The bees swarmed over the trees and the hives were filled as I had never seen them before. The honey was light amber and of fine flavor, and gave my customers the best of satisfaction. While this flow was on, there was scarcely any honeydew to be found except on the pines, and every pine was dripping with it."—C. C. Parsons, Alabama. American Bee Journal, page 546, 1899.

> "We have had the heaviest honeydew flow ever known in this part of the State. We have tons of the stuff."—Scholl. American Bee Journal, August, 1910.

> "My bees stored a quantity of honeydew which granulated in the combs as fast as stored."—South Carolina. American Bee Journal, August, 1910.

> "Of 250 colonies of bees in this town last fall there are not more than 20 left. It is not the winter that kills the bees, but poor honey. Honeydew is half an inch deep all over my honeyhouse floor; it soured and ran out of the combs where I packed up my hives. The bees will not touch the horrid stuff, nor can I get a swarm to go into a hive with one frame of it on one side, and good clean combs and frames of brood for the rest."—Vermont. American Bee Journal, page 458, 1904.

"Bees are working on honeydew, the trees just glistening with it. I have several hundred pounds of it in the supers. It is bad looking stuff, not fit to eat or sell."—Iowa. American Bee Journal, page 537, 1904.

Fig. 75. Hops furnish pollen, but are not important to the beekeeper.

Not all honeydew is of such bad color and flavor. There are numerous reports of honeydew of such flavor and quality that it finds a ready sale in competition with good honey. However, it is usually unsatisfactory for winter stores for the bees, regardless of its source.

**HONEY LOCUST (Gleditsia triacanthos). THORNY LOCUST.**

The honey locust is a well-known tree from Pennsylvania and Ontario to Florida and westward to Texas and Kansas. It prefers rich bottom lands, seldom being found on dry hillsides. The tree has spreading branches and very long, red brown thorns. The thorns are often branched and sometimes nearly a foot in length. At times they cover the trunk of the tree in great abundance. The flowers appear in May or June.

While the honey locust is the source of considerable nectar, it is not equal to the black locust **(Robinia pseudo-acacia).** (See Locust.)

The two species are often confused, although the long thorns peculiar to the honey locust should distinguish it readily.

There are numerous reports to the effect that the bees work freely on honey locust, but it is seldom regarded as a source of surplus, while the black locust yields abundantly for a short period, under favorable conditions.

**HONEY POD, see Mesquite.**

**HONEYSUCKLE (Lonicera).**

The honeysuckles are rich in nectar, but most species have corolla tubes of such depth as to be beyond the reach of the honeybee. There are numerous reports of the bees seeking nectar from such species as they can reach, and from Minnesota come reports of the bush honeysuckle as an important plant. (See Bush Honeysuckle).

**HOPS (Humulus Lupulus).**

The common hop plant is too well known to need description. It is common from New England to British Columbia and southward. It is very generally cultivated for making yeast and for medicinal purposes. The small greenish flowers are wind-pollenated. It furnishes pollen in abundance, but no nectar. (Fig. 75).

Fig. 76. Horsemint (*Monarda punctata.*) The source of the well-known horsemint honey.

**HOP-TREE (Ptelea trifoliata), SHRUBBY TREFOIL.**

The hop-tree occurs from New England and Ontario south to Florida and westward to Michigan, Illinois and Missouri to central Texas. It is a shrub or small tree known also as wahoo and quinine tree. The bitter fruit is sometimes used as a substitute for hops. The flowers have a disagreeable odor. Scholl lists the honey yield as good, and very good, in

favorable seasons, where the shrub is abundant. The California hop-tree **(Ptelea crenulata)** occurs in the western foothills of the Sierra Nevada Mountains and in the Coast ranges. Its bloom has an agreeable aromatic odor. The author can find no reports that indicate it is regarded as important to the beekeepers of that region.

There are numerous reports to the effect that the hop-tree is a good source of nectar in the Eastern States.

**HORSE CHESTNUT, see Buckeye.**

Fig. 77. Wild Bergamot (*Monarda fistulosa*). The corolla tubes are usually too deep for the bees to reach the nectar.

**HORSEMINT (Monarda).**

There are several species of horsemint, known also as bee balm, wild bergamot, etc. Some of the species are represented from New England to Texas. Figure 77 shows **M. fistulosa,** the wild bergamot of the North. The corolla tubes are so deep that, as a rule, the bees are unable to reach the nectar. In some cases it is reported as yielding freely and the author has seen times when the bees were apparently getting considerable nectar from this species. Whether the nectar secretion is unusually abundant or the corolla tubes shortened more than is commonly the case, the author will not venture an opinion. In parts of Wisconsin, **M. punctata** (Fig. 76), according to D. L. H. Pammel, can be depended upon to yield an abundance of nectar every season. This is probably the most important species

to the beekeeper. It is found more or less commonly on sandy soil from New York to Minnesota and south to Florida and Texas. In Texas it is the source of very large quantities of surplus honey in seasons following wet winters and springs. The honey is a clear light amber with a decided minty flavor. It is one of the most important sources in Texas, where, together with **M. clinopodioides,** it is regarded very highly. In the Arkansas Valley of southern Kansas horsemint is also important, yielding as high as fifty pounds of surplus per colony.

Fig. 78. Hound's tongue.

**HOUND'S-TONGUE (Cynoglossum officinale).**

Hound's-tongue is a weed introduced from Europe. It is now common in parts of Canada and the Northwestern States and occurs in Missouri and Arkansas, and from the Ohio Valley to the Carolinas and north Georgia. It is named from the shape and texture of the leaf. The illustration (Fig. 78) was photographed in open woods near Guelph, Ontario. There it is frequently mentioned as a good honey plant.

**HUAJILLA, see Acacia.**

**HUCKLEBERRY (Gaylussacia).**

There are several species of huckleberry common to the Eastern States. The common huckleberry of the markets, the black huckleberry **(Gaylussacia baccata)** is common from Eastern Canada to Minnesota and south to Georgia, in rocky woodlands and swamps. This species also occurs

on the Pacific Coast, and W. J. Sheppard reports it is a honey plant in British Columbia. (Fig. 79).

Lovell reports that it is very abundant on Cape Cod and yields every year.

**HUISACHE, see Acacia.**
**HYDROPHYLLUM, see Virginia Waterleaf.**

# I

**IDAHO—Honey Sources of.**

The principal sources of honey in northern Idaho are fireweed, snowberry, alsike and white clovers. Secondary sources are dandelion, Indian hemp, grindelia and goldenrod.—H. A. Scullen.

Fig. 79. Black huckleberry.

In the southern part of the State alfalfa and sweet clover are the source of large quantities of surplus. Minor plants are probably similar to those of Colorado.

**ILEX, see Holly, also Gallberry.**
**INDIAN BEAN, see Catalpa.**

**INDIAN CORN or MAIZE (Zea mays).**

Indian corn is native to North America and was cultivated by the Indians at the time of the discovery of the continent. It has become one of the most important grain crops and is grown in large acreage. It furnishes an abundance of pollen in mid-summer and the bees work upon the tassels so freely as to give rise to a very general impression that it furnishes

Fig. 80. Indian currant in bloom.

honey in abundance. At times, aphides are to be found upon the stalk and the bees also get a sweet substance from the axils of the leaves. While on infrequent occasions the bees may get honeydew from Indian corn, its principal value to the beekeeper is as a source of pollen.

> "If the weather is favorable for the reproduction of plant lice, we may always expect them to attack the tassel, making the top leaves sticky and discolored. I have seen the bees pile on the tassel until you could scarcely see anything but the bees gathering this honeydew. The honey thus obtained is dark, but of very fair flavor."—Wm. R. Howard, White Rock, Texas. American Bee Journal, page 225. May, 1880.

W. K. Morrison, writing in Gleanings, states as follows regarding corn:

> "Corn is not generally set down as a yielder of the nectar sublime, but in tropical countries it is a very valuable honey plant, showing the importance of locality, showing also that corn is a native of the tropics. (Aug. 1, 1905.)

**INDIAN CURRANT (Symphoricarpos orbiculatus).**

The Indian currant, also known as coral berry or buckbrush, is a widely distributed shrub that furnishes considerable nectar in late summer. It may be found in the woodland borders and open forest from New York, west to the Dakotas, south to Missouri and Arkansas, and from New Jersey south along the mountains to Georgia and Alabama.

The blossoms are very small and inconspicuous (Fig. 80), but where the plant is abundant it is much sought by the bees. In southeastern Iowa, the season of 1914 was a very poor one for the bees, and many colonies required feeding to get them through the winter. In a few localities, where

Fig. 81. Indian currant or buckbrush, showing fruit.

buckbrush abounds, they not only were well prepared for winter, but stored some surplus. The blooming season is July and August in most Northern States, so that the clover harvest is usually nearly over when it comes on. Figure 81 shows the bunches of red berries that hang on the bushes after the leaves have withered and dropped, which will be instantly recognized by anyone familiar with the plant. These berries are often about the only winter food available for small birds when the ground is covered with snow.

The snowberry **(S. racemosus)** (Fig. 82), is a related species with white berries. It occurs from New England west to Nebraska and Dakota, also on the North Pacific Coast. The plant is quite similar to the red-berried species in habit and growth and is also often called buckbrush.

**ILLINOIS—Honey Sources of.**

There are but few important honey plants in Illinois. It is a clover State. White clover, alsike and sweet clover furnish the principal sources of surplus on the uplands, with heartsease and Spanish needle on the low lands. Maples and willows are important for early spring nectar, followed by fruit bloom and dandelion. There are numerous minor sources which add something to the product of the hive, but the above short list includes the important sources of surplus honey. In a few localities boneset and asters yield some surplus in the fall. Basswood, once important, has disappeared from most of the honey-producing districts, where it formerly produced large surplus. For list of minor plants, see Indiana.

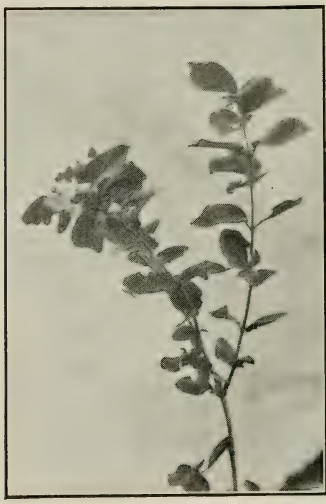


Fig. 82. Snowberry in bloom.

**INDIANA—Honey and Pollen Plants of.**

Skunk cabbage, March.
Silver maple, March-April.
Red maple, March-April.
Box elder, March-April.
Willow, March-April.
Elm, March-April.
Judas tree, April-May.
Dandelion, April-September.
Crowfoot, April-May.
Sugar maple, April-May.

Fruit trees, April-May.
Ground ivy, May-August.
Currant and gooseberry, May.
Buckeye, May.
Grapevine, May.
Black locust, May.
Honey locust, May-June.
Poplar (tulip-tree), May-June.
Raspberry, May-June.
Blackberry, May-June.
White clover, May-June-July.
Alsike, June-July.
Red clover, June-July.
Sweet clover, June till frost.
Basswood, June or July.
Mustard, June till frost.
Button bush, July.
Teasel, July.
Catnip, July and August.
Cucumber, melons, etc., July-August.
Marsh milkweed, July-August.
Sumac, August.
Boneset, July till frost.
Figwort, July till frost.
Buckwheat, August.
Ironweed, July till frost.
Jewelweed, August-September.
Smartweed, August-September.
Goldenrod, August till frost.
Asters, August till frost.
Marsh sunflower, August till frost.
Spanish needle **(Coreopsis),** August.
Beggarticks, August.

—Second Annual Report, Inspector of Apiaries, Indiana.

**INDIAN FIG, see Prickly Pear.**
**INDIAN HEMP, see Dogbane.**
**INKBERRY, see Gallberry.**

**IOWA—Honey Sources of.**

Willows and maples furnish first nectar of importance in early spring. This is followed by the blooming of the wild plums and cultivated fruits. Next dandelion blooms in profusion for most of the time intervening between fruit bloom and white clover. White clover is the main source of surplus over the entire State, excepting a few small areas where sweet clover exceeds it in importance. Alsike is important in some sections. On rough lands along streams buckbrush or Indian currant gives surplus in

midsummer. Heartsease is valuable on low lands over the State and on higher lands in the vicinity of ploughed fields in wet seasons. Asters, boneset, Spanish needle and numerous other fall flowers add something to the production of the hives, but in few localities can be said to be important. Basswood was once of great value to Iowa beekeepers, but has largely been cut down.

**IRONWEED (Vernonia).**

There are many species of the ironweeds to be found in many countries. They are common in Asia and Africa, as well as North America. They are common from New England south to Florida and west to Dakota and Texas. Figure 84 shows the flowers of the western ironweed **(Vernonia fasciculata)** and Figure 83 a clump of the common ironweed **(Vernonia Baldwini).** In the middle west they grow very commonly in pastures, and the purple blossoms are very conspicuous in late summer. At

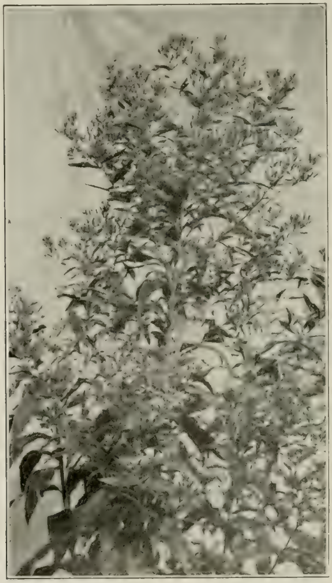


Fig. 83. Clump of common ironweed in bloom.

times the bees work them very eagerly, but it is doubtful whether they are often of much value as a source of surplus.

**IRONWOOD, see Coma, also Titi.**
**IVYWOOD, see Laurel.**

# J

**JACKASS CLOVER or STINKWEED (Wislizenia refracta).**

Jackass clover or stinkweed is a rank scented annual plant with yellow flowers, growing two to six feet high. It is common from Sacramento to Lathrop and southward in the San Joaquin Valley, according to Jepson. —Flora of Middle Western California.

It is an important honey plant in the interior valleys, where it is re-

Fig. 84. Blossoms of western ironweed.

ported as blooming freely only every other year. The blooming period is from August to December. C. R. Snyder, of Selma, regards it as a main source. He reports as high as 100 pounds of surplus per colony. He usually extracts two or three times from this source in September, and has extracted as late as December. A heavy rain or a frost will stop the flow. The honey is light and of good quality. A sample presented to the author is a light amber with a peculiar flavor, unlike our eastern honey. The flavor reminds one somewhat of butter-scotch candy. It is rather strong, but agreeable.

Richter comments on this plant as follows:

"Honey water white, mild in flavor and of good body; granulates in three to six months, when it resembles a paste made from powdered sugar. The very fact that it is spreading so rapidly over the poor lands of the San Joaquin Valley, and that it produces the only water-white honey, with the exception of blue-curls, as far as the writer knows, that is produced in the late fall, has led to the conclusion that jackass clover will be one of the greatest honey-producing plants of the State, and may in future rank next to sage and alfalfa. During the fall of 1909 a Fresno beekeeper reported that he extracted thirty pounds per colony each week for six weeks from this source. Another beekeeper of the San Joaquin Valley relates that during the jackass clover flow the noise was terrific, and that home-coming bees flew so slowly that they could be picked out of the air. It was Henry T. Christman, of Colinga, who first became aware of its value as a honey plant and gave it its present name."

**JASMINE, See Yellow Jasmine.**
**JERUSALEM ARTICHOKE, see Sunflower.**

**JEWEL-WEED or Touch-Me-Not (Impatiens).**

The jewel-weed (Fig. 85) is common in wet places and along small

Fig. 85. Jewel weed, or touch-me-not.

streams in shady situations. Some are to be found from Alaska to New England and south to Florida and Louisiana. . The plant has an odd hanging blossom, as shown in the picture. It is often called touch-me-not, from the sudden bursting of the seed pod when touched.

It is usually regarded as a bumblebee flower rather than a bee flower, but is reported as a source of honey in both Michigan and Wisconsin, where it is quite common in places.

**JOE-PYE WEED, see Boneset.**

**JOINTED CHARLOCK,** see **Radish.**
**JUDAS-TREE,** see **Red-Bud.**
**JUNE-BUD,** see **Red-Bud.**

# K

**KANSAS—Honey Sources of.**

Sweet clover probably ranks first as a honey plant in Kansas. It yields surplus honey from east to west in the State and succeeds on high, dry land as well as in the river valleys. In some parts of the State, surplus honey is secured from no other crop. In the Arkansas Valley alfalfa is also important and yields freely. Hoarhound, heartsease and wild sunflowers also yield surplus. White clover is uncertain in most of Kansas and only yields honey occasionally under favorable conditions. The Arkansas Valley is excellent beekeeping territory and the yields there compare favorably with the best elsewhere. The first nectar comes from soft maples in late February or March. Elms furnish early pollen and willows along the streams furnish both nectar and pollen. There are many orchards in Kansas and fruit bloom is important, surplus occasionally being gathered from apple blossoms. Horsemint is important in the southern part of the State, as high as 50 pounds per colony of surplus being reported from this source.

**KENTUCKY—Honey Sources of.**

H. R. Niswonger, in Circular 69, Extension Division of the College of Agriculture, gives the following as important sources of nectar in Kentucky:

> "Fruit trees and bush fruits of considerable importance, sometimes yielding surplus.
>
> "Crimson clover, very important, coming before white clover.
>
> "Alsike clover, comparing well with the yield from white clover.
>
> "White clover usually yields a heavy surplus.
>
> "Red clover, sometimes worked by bees on second blooming.
>
> "Sweet clover, one of the most important, blooming for four weeks or more.
>
> "Sour-wood, one of the principal sources in the mountain sections.
>
> "Linden, also important in mountain sections.
>
> "Buckwheat, important, coming when there is a dearth of other plants in bloom.
>
> "Goldenrod yields an abundance of nectar.
>
> "Aster yields in late autumn, often sufficient to carry the bees through the winter, sometimes some surplus, also.
>
> "Many forest trees infested with plant lice yield large quantities of honeydew.

In addition to the above list the following are taken from a contribution to American Bee Journal by Mr. N. P. Allen, of Smith's Grove, Kentucky:

"Elm, elder, hazel and willow for early pollen.

"Maples.

"Red-bud or Judas tree.

"Black locust.

"Blackberry and raspberry.

"Poplar (tulip-tree), begins to bloom about the middle of May and yields more honey than any forest tree.

"Prickly ash and sumac.

"Yellow-wood and coral berry in July."

**KINNIKINICK (Rhus virens).**

Kinnikinick is a sumac which grows from the Colorado River to the Rio Grande and westward. The Indians and Mexicans mix the leaves with tobacco and smoke them. It grows in large quantity in the hills some distance north of Uvalde, Texas, and blooms from September till frost, with sufficient rain. Local beekeepers report that as high as sixty pounds of honey per colony is sometimes secured from this source. The honey is said to be green in color, with a rank, strong taste, and does not granulate. The combs are capped very white when the bees are working on kinnikinick. This should not be confused with the species of dogwood which is also commonly called by the same name. There are several species of sumac which are valuable honey plants. (See sumac; also dogwood).

**KNAPWEED, see Star Thistle.**

**KNOCKAWAY or ANAQUA (Ehretia elliptica).**

The anaqua is a common tree with small white flowers in open panicles and oval leaves, which is common from New Braunfels, Texas south to the lower Rio Grande. It is commonly reported as a valuable source of nectar by Texas beekeepers.

**KNOTWEED, see Heartsease.**

# L

**LADIES' EAR DROPS, see Brunnichia.**
**LADY'S THUMB, see Heartsease.**
**LAMBKILL, see Laurel.**

Fig. 86. Sheep laurel, or lambkill.

**LAUREL (Kalmia).**

The mountain laurel **(Kalmia latifolia),** also known as calico-bush or spoon-wood and in the Southern States as poison ivy, is a common shrub occurring in the higher altitudes from New England and Ontario south to the Gulf States. It is widely credited as being the source of poisonous honey. (See Poisonous Honey). The sheep laurel or lambkill (Fig. 86) is a closely related species which occurs from Newfoundland and west to Michigan and south to north Georgia. They are shrubs with showy flowers which are not often reported as important honey plants. In some places, hillsides are covered with the mountain laurel, which makes a

pleasing sight when in bloom. These plants are so well known that a great variety of common names have become known in different localities.

According to Sladen, the sheep laurel **(Kalmia angustifolia)** is one of the important sources of honey in Nova Scotia.

**LAUREL-TREE, see Red Bay.**
**LEATHERWOOD, see Ti-ti.**

**LEMON (Citrus limon).**

The lemon is a valuable source of honey in southern California, though much less is heard of it than of orange. It is cultivated principally in the coast region, and Richter suggests that the proximity to the ocean of the principal lemon groves may account for the fact that it does not yield as well as orange. Unlike other fruit trees, it blooms more or less continuously throughout the year. This again would make its real value less apparent, since a plant which yields a little nectar for a long period of time may give a total greater than one which gives a heavy yield for a short period. It is noted, also, that oranges yield less freely along the coast than in the interior valleys.

**LETTUCE (Lactuca floridana).**

Figure 87 will give a good idea of the height to which the wild blue lettuce grows. It is common in the woodland borders, in rich soil, from Pennsylvania to Iowa and south to Florida and Texas. The plant produces hundreds of blue flowers in late summer and early fall. Although it is of no special importance as a honey plant, the bees visit it frequently and apparently get some nectar from its blossoms. In the South it is reported as blooming in May and June. The writer does not recall having seen it in bloom in Iowa earlier than August, while it blooms into September. There are a considerable number of species of wild lettuce, some of which, like the prickly lettuce, become very troublesome weeds. The writer has not observed the bees working to any extent on any except the blue fall lettuce above described.

**LEONURUS, see Motherwort.**
**LIGNUM-VITAE, see Soapbush.**
**LILAC, see Mountain Lilac.**

**LIME (Citrus acida).**

The lime is a fruit very similar to the lemon, which has been introduced to some extent into the citrus districts. Since it is not generally grown it is not very important, though it yields honey freely.

**LIMETREE, see Basswood.**
**LINDEN, see Basswood.**
**LION'S TAIL, see Motherwort.**
**LIPPIA GRASS, see Carpet Grass.**

Fig. 87. Wild lettuce is a tall growing plant.

**LIQUORICE (Glycyrrhiza lepidota).**

The wild liquorice is a plant of the pulse family occurring from Minnesota to Missouri and westward to Washington and Arizona. It is found in Colorado and Wyoming at 4,000 to 8,000 feet altitude. It is reported as quite abundant in places in Wyoming, and some years as being a great yielder of nectar.

**LIVE OAK, see Oak.**

**LOCALITY.**

The plants which yield honey in surplus quantity are comparatively few in number. In the average locality there will be only two or three

important sources of nectar, with a considerable number of minor ones which furnish the bees with a partial living between the main flows.

As an example, a typical Iowa locality may be mentioned. There white clover is the principal source of surplus honey. Now and then some surplus will be gathered in the fall, also, from heartsease. Yet the list of plants which yield nectar in that particular neighborhood is a rather long one. Were it not for these minor sources, to provide for the bees before and after the clover flow, beekeeping would hardly be possible there. To begin the season, fruit trees, apples, cherries and plums, furnish a liberal supply of nectar. These trees bloom early in spring when the bees are still weak from the long winter. If it were possible for the beekeeper to so conserve the strength of his colonies that they would come through the winter in as good condition as they are in mid-summer, a good crop of surplus honey would be gathered from fruit bloom in favorable seasons. Following fruit bloom, the dandelions come. There are several weeks of bloom from dandelion and the bees make the most of it. Considerable nectar and an abundance of pollen are gathered from dandelion, only to be used in brood-rearing. It takes a large amount of honey to rear a big force of bees, and without strong colonies of bees profitable crops of honey cannot be harvested. It takes honey, then, to make bees, and it takes bees again to gather a big crop of honey.

The dandelion continues to bloom, in some localities, until within a short time of the opening of the white clover flow. In favorable seasons, when the clover is abundant and weather conditions favorable, a liberal crop may be expected from the clover. Following the clover there is a long period when but little honey is coming from the field. In one neighborhood the bees may be entirely idle, while a short distance away there may be sufficient forage to support the colony. In the one location the surplus gathered from clover will be consumed, in part, to support the colony until the fall flow from heartsease; in the other the bees will gather enough from minor plants to support them. The one locality thus becomes a good one for beekeeping, while the other is poor, and perhaps they are but a few miles apart.

This is a fair example of general conditions. The locality may not be in the clover region, but the presence or absence of the minor plants is extremely important to the beekeeper who would support his family from the products of his apiary.

There are many locations where the presence of plants which yield pollen abundantly are second in importance only to the plants which furnish the main honeyflow. As an example, there are places along the Appalachicola River, in Florida, where enormous yields of surplus honey are sometimes secured from tupelo, but where there is so little pollen for the rest of the summer that the bees suffer seriously for the lack of it. In some places the beekeepers find it necessary to move their bees to other locations in order to maintain the strength of their colonies, following the flow from tupelo. Thousands of colonies of bees have died in locations where wonderful yields of honey have been harvested, because no pollen was available to enable them to continue brood-rearing.

It often happens that the crop will be a failure in one location, while but a few miles away it would be possible to gather a surplus by moving the bees. As an example, at Hamilton, Illinois, in 1919, the clover crop was a failure and the bees were on the point of requiring feed at the time when the clover harvest should be coming in. By moving their bees from fifteen to forty miles, the Dadants were able to harvest about forty thousand pounds of honey, instead of feeding to carry their bees through the winter.

It has become the practice of many California beekeepers to secure more than one crop by moving their bees several times during the season. Following the harvest from one source, the bees are moved by truck to other fields. Thus it is sometimes possible to use the same apiaries to harvest two or three good crops in a single season.

In like manner a well-known California queen breeder has found it possible to greatly increase his output by moving his queen-rearing yards to new fields when the nectar supply had ceased in his own location.

The variation in the supply of nectar in different localities is extremely great. A few locations will support several hundred colonies in one yard. Other locations will hardly support twenty colonies profitably. A careful study of the flora within reach is most important to the beekeeper. One who fully understands his location can adapt his system to his conditions and succeed where failure would otherwise result. John W. Cash, of north Georgia, had about eight hundred colonies of bees in a section where thirty colonies would overstock any single location. By establishing a large number of apiaries in widely scattered situations, he was able to secure a surprising uniformity of yield. For a period of several years he never secured less than 56 pounds average of surplus per colony. At the same time his highest average was 86 pounds per colony.

The combination of plants which yield surplus honey with those which yield pollen and those which furnish some nectar during the periods between the flows, together with climatic conditions, determine the value of a location for beekeeping. It does not require much skill to secure a crop of honey in a location where every condition is favorable, but the man who is fully acquainted with the flora will discount the crops of the hit-and-miss apiarist even there. In the poor locality it takes a thorough knowledge of the sources of honey and pollen, together with expert beekeeping to succeed.

**LOCO WEED (Astragalus). Also called Rattle Weed or Buffalo Bean.**

There are several species of **Astragalus,** common to the Rocky Moutain region, from Manitoba south to Texas, and west to California. The loco weeds are herbs with odd-pinnate leaves, and spikes or racemes of purple, white, or pale yellow flowers.

Several varieties are poisonous and are the source of heavy losses among the stockmen of the plains and mountain regions. Honey from loco is reported principally from Colorado, where it is mentioned as blooming with horsemint, in May and June. It is to be found mostly in the foot-

hills and the yield is not dependable. The honey is reported as of light color and good flavor.

**LOCUST (Robinia pseudo-acacia).**

The black locust, or false acacia, is a native tree from Pennsylvania to Iowa and southward. However, it has been widely introduced into other States, thus greatly extending its range. It is now to be found in many places from New England and Canada southward. It is reported as producing a surplus of honey in parts of California, and is listed among the honey plants of Texas.

Fig. 88. Blossoms of black locust, or false acacia.

The wood is desirable for posts, railroad ties and other purposes requiring durability. Large plantations are often set for utility purposes, so that in some localities the beekeeper may readily expect a surplus from this source. Borers are a serious menace to the life of this tree, and whole plantations of locusts are sometimes injured by the insects, which kill the branches and sometimes the bodies of the trees, causing them to sprout again from the root.

According to Lovell the honey is water-white, of heavy body and mild flavor. Figure 88 shows the blossoms and leaves. The flowers, it will be noted, much resemble those of the garden pea.

In some localities the tree is known as white or yellow locust.

**LOGWOOD (Haematoxylon campechianum).**

The logwood is an important tree common to the West Indies and Central America, but probably does not occur within the United States. It is the principal source of vegetable dyes, most of which have been displaced by chemical products.

It grows in dense forests over large areas and in Jamaica is regarded as the principal source of honey. When conditions are favorable enormous crops of honey are harvested, single colonies sometimes gathering several hundred pounds. Since the forests are often miles in extent, large apiaries can be supported in a single location. The plant usually blooms twice during the year, once in November and the second time near the holiday period. That weather conditions affect the flow from logwood as readily as that of other plants will be seen by the following quotations from American Bee Journal of June 8, 1905:

> "I noticed unmistakable evidences of an almost universal bloom, and about ten days later it came out in all its glory. It was truly a magnificent sight, and although the house was about 500 feet from the apiary, the roar of the bees passing to and fro was a sound to make glad the heart of any beekeeper. I went down to the apiary one morning about 6 o'clock, and if I live to be 100 years old, I never expect to see a more stirring scene in any apiary than I looked upon in that yard of 250 colonies. * * * They kept up this pace for four days; but, alas, it rained that Saturday night, and the next morning the logwood blossoms were as brown as though they had been burnt, and the flow was over. Six thousand pounds for the four days was the record."

The honey does not sell readily in American markets in competition with our mild-flavored clover and alfalfa produce. We quote further:

> "Prices we received ran from a fraction below 2 cents per pound for dark to a small fraction below 3 cents for the best, which was one of the finest samples on the island."

((See also Brazil.)

**LOMBARDY STAR THISTLE, see Centaurea.**

**LOQUAT (Eriobotrya japonica).**

The loquat (Fig. 89) is a Japanese fruit of evergreen habit and fragrant white flowers which has been introduced into parts of California. The tree is cultivated for ornament and for its edible fruit, which resembles a small yellow pear. It blooms in winter in California and is said to be an excellent honey plant.

**LOOSESTRIFE, see Purple Loosestrife.**

**LOUISIANA—Honey Sources of.**

Louisiana has a large variety of sources of nectar, with no one plant of special importance, in all parts of the State. Fruit bloom and forest trees furnish early nectar and pollen. In the northwest part of the State, near Shreveport, alfalfa is reported as a source of surplus. Holly, locust, tupelo, blackberry, asters and cotton are among the sources commonly

reported. There are many minor plants which yield nectar and some in surplus quantity in limited localities. Much remains to be learned concerning the honey flora of this State.

Willow yields honey in such abundance that much honey is stored from it at times. White clover also yields, but is seldom important. Senna, horsemint, goldenrod and Spanish needle yield some honey in the fall.

Fig. 89. The loquat.

**LUCERNE, see Alfalfa.**

**LUPINE (Lupinus).**

There are many species of lupines which are common, especially in the plains region and west to the Pacific Coast. Some are of no value to the

bees, while others are good honey plants. Richter lists **Lupinus affinus** as a source of nectar in California.

The blue lupine or bluebonnet **(Lupinus subcarnosus)** is widely distributed over southern and western Texas, fairly covering large areas when in bloom. The blooming period comes in March or April and the author heard many reports of this plant, as an important source of early honey when visiting Texas. Some claim it yields only pollen. Scholl lists it as a source of honey.

In Colorado, beemen regard some lupines as good honey plants, also.

**LYTHRUM,** **see Loosestrife.**

# M

**MADRONA (Arbutus menziesii). THE ARBUTE TREE.**

Jepson describes the madrona tree as evergreen with glossy, leathery leaves, widely branching, 20 to 125 feet high; bark polished, crimson or terra cotta, on old trunks dark brown, and fissured into small scales. Coast ranges of California, oak hills, etc. Grows on high ridges, mountain slopes and in gravelly valleys.

According to Richter it yields both nectar and pollen from the flowers.

**MAGNOLIA or BULL BAY TREE (Magnolia grandiflora).**

The magnolia is native to moist soils from North Carolina to Florida and west to Texas. It is the largest leaved tree of the evergreens. It is a magnificent tree when uncrowded and is a favorite shade tree in the South. The thick, leathery leaves persist over winter until the new ones have appeared, The flowers are large and showy and the blooming period is from spring till midsummer.

The sweet bay **(Magnolia virginiana),** known also as laurel magnolia, swamp laurel and beaver tree, grows in swamps from Massachusetts to southern Florida and west to Arkansas and Texas. In Texas it is reported as yielding very dark honey of poor flavor.

Magnolia is not often mentioned as important, though an occasional report of surplus in the South is received. One beekeeper reports that in Mississippi the honey is so dark and strong as to be unpalatable.

> "We had three days of cool, damp, cloudy weather last year in August. During that time I visited my magnolia apiary, and on approaching it I heard the heavy roar of bees. I first thought that wholesale robbing was in full force, and I soon saw that they were gathering honey, and on looking at the alighting boards I saw particles of magnolia blooms. This told the tale. I went a few rods into the swamp, which was decorated with the large, rich magnolia blooms. I examined a bloom and there was the nectar visible, and all the bees had to do was to alight, fill themselves and return. The weather soon cleared

off and the magnolia honey was no more. Those three days of damp, cool and cloudy weather saved many old style gums from being turned bottom up, in the spring, in this section."—J. J. Wilder, Cordele, Georgia. American Bee Journal, Feb. 15, 1906.

**MAGUEY, see Century Plant.**
**MAHOGANY GUM, see Eucalyptus.**

**MAINE—The Honey Flora of.**

A large number of plants produce both pollen and nectar, but in Maine comparatively few yield a surplus of honey—the most important being white clover, alsike clover, fruit bloom, raspberry, fireweed and goldenrod.

Aster **(Aster).** The asters are of some value in this State, and in late fall bees may be seen frequently on the flowers. **Aster paniculatus** appears to be the most important. In some localities in the Middle States the ground is white with the blossoms of field asters. Pure honey, white or perhaps sometimes light amber. It is gathered so late that often it may not be fully ripened.

Apple **(Pyrus malus).** Yields a small surplus occasionally in this State. Honey of fine quality, light amber with aromatic flavor.

Basswood **(Tilia americana).** So rare in this State as to be of little importance.

Blackberry **(Rubus).** Yields little nectar in the Northern States; but a surplus is reported in Georgia and California.

Boneset **(Eupatorium perfoliatum)**.. Visited by insects in large numbers, but not common enough to yield a surplus.

Buckwheat **(Fagopyrum esculentum).** Not extensively grown in Maine, but fields of it are cultivated in many localities. A dark, purplish honey.

Button-bush **(Cephalanthus occidentalis).** Common in swamps, but not important.

Canada Thistle **(Cirsium arvense).** Not very important in this State. but more common westward. Honey light and well flavored.

Carrot **(Daucus Carota).** Naturalized from Europe, common in fields.

Clover, white **(Trifolium repens).** A fine white honey of delicious flavor. Alsike clover **(T. hybridum)** is an equally good honey plant, honey similar. Both are abundant in Maine, especially northward. In dry seasons bees are able to gather nectar from red clover, a bumblebee flower.

Cucumber **(Cucumis sativus).** A good honey plant in the neighborhood of pickle factories. Honey with flavor of the fruit, but improves with age.

Currant **(Ribes).** The various species of currants and gooseberries, both wild and cultivated, are of some importance.

Dandelion **(Taraxicum officinale).** More valuable for pollen than nectar in this State. Honey golden yellow, thick, strong-flavored, crystallizing in a few weeks.

Goldenrod **(Solidago).** A most valuable honey plant in New England. In southern Maine it never fails to give a large surplus, the main dependence of the beekeeper for winter stores. Honey golden yellow, fine

flavored, candying with a coarse grain in a few months. **Solidago graminifolia** and **S. rugosa** are the most important species in this State.

Heartsease **(Polygonum persicaria).** This plant, so valuable in Illinois and Nebraska, is of no importance in Maine; a bee is rarely seen on the flowers.

Horse-chestnut **(Aesculus Hippocastanum).** Not common, bees gather both nectar and pollen. Bumblebee flowers.

Locust, black **(Robinia pseudo-acacia).** Yields a surplus of white honey further south, but not abundant in Maine. Often cultivated.

Maple **(Acer saccharum).** The rock maple blooms in spring before the leaves appear and the flowers are visited by bees in great numbers. The red maple also yields nectar.

Milkweed **(Asclepias syriaca).** Where the milkweed is abundant it is a great help to the beekeeper. In Michigan it is increasing, and perhaps also in Maine. The honey is excellent, with a fruity flavor.

Mayweed **(Anthemis cotula).** Common by the roadside, a bitter honey, apparently not important in this State.

Mustard **(Brassica).** Very abundant in grain fields, where the flowers often present an unbroken sheet of yellow. Probably never yields a surplus in Maine.

Pear **(Pyrus communis.)** Not of much importance, but has been known to yield nectar very freely under suitable conditions.

Plums and cherries **(Prunus).** All the species secrete nectar. The choke-cherry, which is common in thickets, attracts many insects.

Raspberry **(Rubus idaeus,** variety **aculeatissimus).** One of the best honey plants, where the forest has been lumbered. A splendid honey of finest flavor, suggestive of the berry.

Sumac **(Rhus typhina).** This common shrub has the staminate and pistillate flowers on different individual plants; not common enough in Maine to yield a surplus. Honey bright amber, with a bitter flavor at first, which later disappears.

Sweet clover **(Melilotus alba).** Does not grow well on the clay soil of this State; requires a limestone soil.

Willow **(Salix).** Valuable in spring for both pollen and nectar, a great help in building up the colonies and bridging over backward springs. The pussy willow **(Salix discolor)** is most important. It could be planted to advantage in useless wet land.

Willow-herb **(Epilobium angustifolium).** Also called greweed, since it springs up abundantly on land which has been burned over. An excellent honey plant; honey water-white; flowers red purple.—John H. Lovell, Bulletin of the Maine Department of Agriculture, Vol. xvii, No. 4.

**MAIZE, see Indian Corn.**

**MALLOW (Malva).**

Several lists of honey plants contain some mention of the mallows. The bees visit the flowers for both nectar and pollen, but the author can find no record to indicate that they are anywhere important.

**MANCHINEEL (Hippomane mancinella).**

The manchineel is an evergreen tree common to the beaches and marshes of southern Florida and the Keys; also found in the Bahamas and Tropical America. It is very poisonous, and Britton credits it with being the most poisonous of our American trees. He states that the milky juice was used by the Caribs to poison their arrows.

It yields nectar abundantly some seasons and is the source of surplus honey. According to E. G. Baldwin, it blooms with pigeon cherry and with dogwood, and the late O. O. Poppleton was the only man to attempt to harvest a crop from the tree, growing as they do on the Keys, where not easily accessible. He credits Poppleton with a yield of 28,000 pounds from the three together in 1910.—Gleanings, April 1, 1911.

**MANGROVE, see Black Mangrove.**

Fig. 90. Manzanita.

**MANITOBA—Honey Sources of.**

In eastern Manitoba the blueberry yields some surplus. The main sources of nectar for the Province are white clover, alsike, fireweed, snowberry, perennial sow thistle, Canada thistle, wolfberry, mustard, goldenrod, aster and numerous prairie and weed plants. To these are added willows and maples as sources of early nectar.—F. W. L. Sladen.

**MANZANITA or BEARBERRY (Arctostaphylos).**

Figure 90 shows the blossoms and leaves of the manzanita, which is seldom heard of as a honey plant east of California. The following information is copied from Richter's "Honey Plants of California":

> "**Arctostaphylos,** manzanita, bearberry. Throughout coast ranges, Sierra Nevada foothills and San Bernardino Mountains (2,000 to 9,000 feet), November to February.
>
> "The honey is amber and of excellent flavor, much like manzanita itself (Colusa County); pollen. San Diego County reports a white honey from the manzanita. One of the most important honey plants to induce bees to early breeding. In some parts of Monterey, Colusa and Eldorado Counties, a 20 to 40 pound surplus is obtained, and on very warm days (Monterey County) nectar can be shaken from the bloom. A beekeeper from Applegate reports it to be his best honey yielder."

The **Arctostaphylos uva ursi,** bearberry or bear grape, according to Gray, occurs on the rocks and bare hills from New Jersey and Pennsylvania to Missouri and far north and westward. It is also said to be common in Europe and Asia. It is recorded in the local lists of plants of Connecticut and Ontario, although, probably because nowhere abundant, it is not known as a source of honey. Although Richter's list does not give the species from which their honey is secured, it is probably **A. manzanita** or **A. tomentosa,** or other species peculiar to the West Coast.

The leaves of the eastern species are much used in medicine. It is said to be an astringent tonic, used in diseases of the liver.

**MAPLE (Acer).**

Almost all of the early pollen and nectar comes from trees, and most of the trees bloom early. The maples are mostly large trees confined to North America and temperate regions of the old world. Two species are commonly planted for shade and ornament—the sugar maple or hard maple **(Acer saccharinum)** and the red maple or soft maple **(Acer rubrum).** The photographs show the blossoms of the soft maple. (Fig. 91.)

Maple lumber is commonly used in the manufacture of furniture, flooring and finishings. The blossoms come very early, when especially valuable in building up colonies for the main honey flow. If the bees were as numerous as later, the nectar stored from maple blossoms would make a creditable yield. Mr. C. L. Pinney, of Iowa, reports that one year his scale hive showed a gain of from one to two pounds daily from soft maple, when the ground was still covered with snow.

If it were possible to have colonies come through the winter with as many bees as they have at the beginning of winter, beekeeping would be a bonanza. Instead of having one or two flows, there would be first a flow from maple and willow, followed by one from dandelion and fruit bloom, ahead of the big clover flow. However, the beekeeper whose apiary is situated near plenty of such trees as willow, maple, elm and box-elder is fortunate, indeed, for the bees get a splendid stimulation very early, and should be in prime condition for business when clover comes on.

The big-leaf maple of the Pacific Coast **(Acer macrophyllum),** also

known as Oregon maple, California maple, water maple or white maple, is reported as of special importance in Oregon and British Columbia, its yield is usually cut short by rains. It is found in the Sierra Nevada and coast ranges of mountains in California, north to southern Alaska. (See also Box-elder).

Fig. 91. At left staminate blossoms and at right pistillate blossoms of red maple. Both yield nectar.

**MARIGOLD (Gaillardia pulchella).**

There are several species of **Gaillardia** common to a wide scope of country. This particular species ranges from Louisiana west to New Mexico and Arizona. It is the source of large quantities of yellow honey in Texas, where it is highly regarded as a honey plant. It is reported as yielding surplus occasionally as far south as Brownsville, though not frequently.

Scholl lists it as "a main source of surplus; honey dark amber and of good quality. May and June." (See also Spanish needle.)

**MARJORAM (Origanum vulgare).**

The marjoram is an European plant, cultivated in gardens, which has become naturalized along roadsides in the Atlantic Coast States. According to Lovell, it is a favorite of honeybees; not sufficiently common to be of much value.

**MARRUBIUM, see Hoarhound.**

**MARYLAND—Honey Sources of.**

Willows, maples, fruit blossoms and dandelion furnish nectar and pollen for spring brood rearing. Tulip-poplar is probably the most important source of surplus where the bees are prepared to gather it. Coming so early, few beekeepers have their colonies ready for this flow. Clover, locust, sumac, holly, laurel, clethra, heartsease, Spanish needle, asters and goldenrod are valuable. Tupelo and black-gum are also to be found in the State. There is a long list of minor sources similar to those listed for New Jersey.

**MASSACHUSETTS—Honey Flora of.**

White clover, found in nearly all quarters of the State.

Alsike clover. Under favorable conditions it yields not only a good quality of nectar but large quantities of it.

Red clover. The second flowering is somewhat accessible to bees.

Sweet clover. Two species, neither abundant in Massachusetts.

Goldenrod and asters. Rank close to clovers in nectar production.

Fruit bloom. Apple, pear, cherry, plum, peach, etc., source of early stores, upon which the colonies build up for the clover harvest. The body is heavy, the color clear and light and the flow comes with a rush, which insures handsome sections; but best of all is the exquisite aroma of the apple blossom, which places fruit bloom honey in a class by itself.

Linden or basswood. Doubtless the most valuable tree honey plant in Massachusetts.

Buckwheat. Reported from all counties in Massachusetts.

Wild raspberry and blackberry. The nectar flow is of long duration, beginning after fruit bloom has ceased.

Several species of sumac are important honey sources which are greatly underestimated.

Locust. A valuable forage for bees. Reported as sporadic in yield.

Maple. Probably of less importance as a honey plant than the mints, strawberry and milkweed.

Clethra. Known also as black alder and sweet pepper bush. A valuable honey secreting plant, largely confined to a belt paralleling the eastern coast.

Milkweed. Where milkweed occurs in large quantities it is a valuable honey plant. Reported as important from Berkshire County.

Wild cherry, knotweed, dandelion, strawberry, chestnut, mints, gill-over-the-ground and mustard also reported occasionally as valuable.

Willow and skunk cabbage valuable for early pollen as well as some nectar.—Burton N. Gates. Bulletin 129, Mass. Ag. Ex. Sta.

**MAT GRASS, see Carpet Grass.**

**MATRIMONY VINE (Lycium vulgare).**

Matrimony vine is a low, spiny shrub, with very long. lithe and almost climbing branches. It came originally from the Mediterranean region and was very generally planted for ornament about American homes a generation ago. It is very persistent, and has run wild about many deserted home sites. The small flowers clustered in the axils of the leaves are very attractive to the bees, and, where sufficiently common, the plant is probably of considerable importance.

**MAYWEED (Anthemis Cotula).**

The mayweed or dog fennel is an old-world weed extensively naturalized from Canada to the Gulf of Mexico and west to Texas. It is common along roadsides, in barn lots and waste places generally. Lovell credits it with yielding a honey that is light yellow in color and very bitter. It is seldom mentioned as a source of nectar.

Richter states that because of its blooming between spring and summer it is of considerable value to many Sacramento Valley beekeepers.

**MEDICAGO, see Alfalfa.**
**MELIA, see China Tree.**
**MELILOTUS, see Sweet Clover.**
**MELISSA, see Bee Balm.**

**MELONS (Cucumis melo).**

Melons are valuable sources of honey. In locations where they are grown in large acreage, as in the Rocky Ford district of Colorado, considerable quantities of honey are stored from them. There are numerous varieties of muskmelons, canteloupes, etc., but apparently there is not much difference in the value of the various sorts to the beekeeper.

As with cucumbers and pumpkins, the male and female blossoms are on different parts of the stem. Bees and insects carry the pollen from one to another, if in close proximity, and often cause hybridization.

**MENTZELIA.**

**Mentzeli speciosa** is a conspicuous plant along roadsides and waste places in Colorado. Its large white blossoms are closed during the heat of the day, but beekeepers report that the bees work upon it freely in early morning and late evening. It is probably not important.

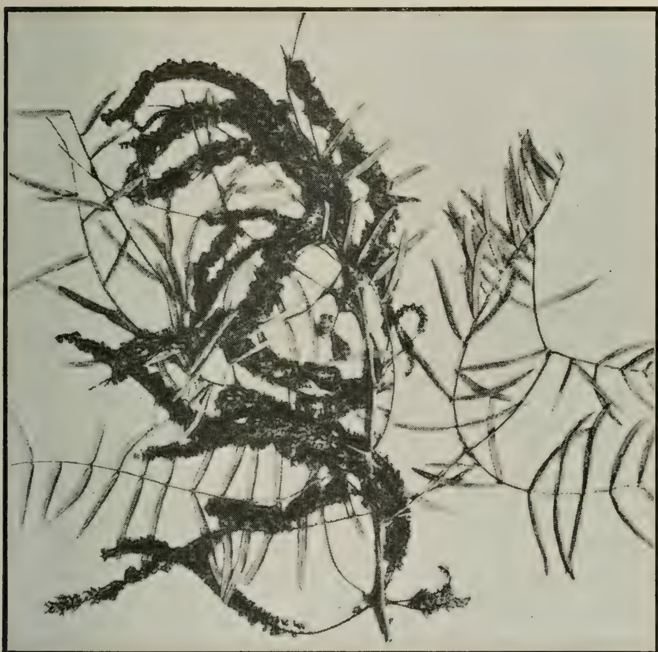
In Oregon the stickleaf **(Mentzelia albicaulis)** grows freely on dry, stony land. It has a spreading habit and its pale orange colored flowers are very attractive to the bees.

**MESQUITE (Prosopis glandulosa).**

The mesquite, or mezquit, is the most important plant of the arid regions from central Texas to New Mexico and eastern California. At a distance it has much the appearance of an aged peach tree. A northern

man riding through the mesquite region on the train, for the first time, remarked that he had never seen such extensive peach orchards in his life. The tree is much branched and spreading in habit and is the source of fuel for the inhabitants of the region. Live stock also are fond of the leaves and pods and the Indians of the Southwest eat the seeds, first grinding them into meal and baking them.

The same or a closely related species is common in Hawaii, where it is known as algaroba. There it is one of the most important sources of honey. (See Hawaii). This species is sometimes called honey-pod or honey-locust, although the true honey-locust is a very different tree.



Mesquite is one of the most important sources of honey in the Southwest.

In the desert regions of California it is an important source of large quantities of honey, as it is in Arizona, New Mexico and Texas. In southwest Texas mesquite is the principal source. The honey is light amber and of good quality. Beekeepers report that it is lighter in color some years than others, even though nothing is blooming at the same season, so

the difference cannot be laid to a mixture of honey from different sources. The quality of mesquite honey is good. It is reported to yield more regularly on sandy land than on heavy soil.

There are two blooming periods, the first in spring, usually in April, and the second in July. If there has been plenty of moisture previously the mesquite blooms profusely, due to the fact that it roots very deeply and can reach any moisture that is available in the soil.

### MEXICAN CLOVER (Richardia scabra).

The name clover is a misnomer, for this plant does not belong to the clovers but to an entirely different group. It is a luxuriant annual weed growing to a height of two feet or more. The bees are reported as working upon it quite late in the season.

The plant was introduced from the tropics and has become naturalized in Georgia, Florida, Alabama and Mississippi.

### MICHIGAN—Honey Sources of.

While Michigan is within the clover belt, there are a greater variety of sources of surplus honey than in most nearby States. In spring, willows, maples, fruit bloom and dandelion have the usual importance. Both white and alsike clover yield surplus in Michigan. To these may be added wild raspberry, fireweed or willow herb and milkweeds, all of which are important sources of surplus honey in the northern part of the State. Basswood was formerly important and still produces surplus in some sections, though many of the basswood forests have been cut. Buckwheat is also a source of surplus in some parts of Michigan, though according to E. D. Townsend surplus from buckwheat is only to be expected on "a rather poor quality of sandy soil." Townsend says, further, that alsike is worth all other sources put together in the southern two-thirds of the lower peninsula, and that aster yields surplus in Sanilac County.—Gleanings, page 1184, 1908.

### MIGNONETTE (Reseda odorata). COMMON MIGNONETTE.

The mignonette of our gardens is a native of Egypt which came to America by way of Europe. It is frequently mentioned as a honey plant, especially in older literature. Some extravagant claims have been made for it, but perhaps it has never been given a fair test on a sufficiently large scale to demonstrate fully its value. The following extract from an article which appeared in the American Bee Journal, Page 47, 1878, is of interest in this connection:

> "After being started under diligent cultivation it was astonishing to see the rapid progress which they made. The plants soon covered the ground, where soil was good, and were out in blossom in a short time, and from that time forward the bees were working on them by the thousand from morning till late afternoon. I have seen them thick on it by 8 o'clock. It yields pollen as well as honey. * * *
>
> "I have found that on account of the spikes of the blossom being so much longer, the bees must work on the larger varieties. I have

some sorts which stand two feet high, the spikes being from eight to ten inches long. * * *

"A correspondent from California stated that he thought an acre of mignonette would be adequate for a hundred colonies. * * *

"When you give them this in addition to what they would otherwise have, it will certainly secure an immense addition to the honey produced. There is no plant within the range of our knowledge as valuable for bee forage as mignonette. It will bloom year after year if not disturbed by frost and gives a longer period of bloom than any other plant. It gives more blossoms in a given space and more forage than any plant we have ever seen. Honey from this plant has the most delicious fragrance of any we have ever tasted."—William Thompson.

It was later tested at the Michigan Agricultural College, but Professor Cook failed to bear out the above claims. He reported as follows:

"I expected great things of this plant, as the bee papers were very high in their praise of its qualities. June 23 it began to blossom, and it was not till the 27th that the bees began their work upon it. They did not seem to take to it very readily, for on every occasion that I made observations, I found very few bees present. With us it proved a failure. Others have corroborated this statement. * * * It is rather a delicate plant for this climate."—Page 83, A. B. J., 1878.

It is listed by Richter in Bulletin 217, "Honey Plants of California," with the statement that it is "very much visited by bees whenever in bloom."

**MILK VETCH (Astragalus).**

The milk vetch is a close relative of the loco (see Loco), and like the loco is visited by the bees. Some species are of some value for honey, especially in the plains region west of the Missouri River.

**MILKWEED (Asclepias).**

The milkweeds are a large family of plants common to the temperate and tropical regions of many parts of the world. North America alone has 55 recognized species. These plants are also known as butterfly weeds and milkweeds. The blossoms are borne in large ball-shaped clusters as shown in Figure 92. The seeds are attached to silken parachutes. on which they are carried by the wind. It is these silky attachments that give rise to the name "silkweed." Remarkable yields of honey are sometimes secured from milkweeds. An average yield of 100 pounds per colony from this source is occasionally reported through the bee magazines.

Much has been written about the entangling of bees in the pollen masses of milkweed. It frequently happens that bees thus entangled are unable to free themselves and die as a result. Some species of milkweed is included in nearly every list of honey plants which the author has consulted. Apparently it may be regarded as of some value almost everywhere. The honey is said to be light in color and of good quality.

It is of special importance in northern Michigan, where it grows in great abundance, as shown by Figure 93. In some locations beekeepers report an average per colony production of 50 pounds, year after year, from milkweed.

Fig. 92. Blossoms of the milkweed.

**MILKWEED VINE, see Bluevine.**

**MINNESOTA—Honey Sources of.**

In early spring the willows and maples, followed by dandelions are important for spring brood rearing. Fruit bloom is also valuable in spring. White clover and alsike are the most important sources of surplus. Probably there is no place in the world where these clovers yield nectar more abundantly than in Minnesota. Sweet clover is also important in some sections of the State. Willow herb or fireweed, basswood, goldenrod and asters may be mentioned.

**MINT (Mentha).**

Richter lists the spearmint, or peppermint, **(Mentha spicata),** as yielding a great abundance of amber colored honey in Sacramento County, California and southward. Spearmint was introduced from Europe and has escaped from cultivation and become naturalized in many places, both east and west.

He also lists the tule mint **(Mentha canadensis)** as yielding honey from

July to October. The mints belong to an important group of honey plants and where sufficiently common are valuable. They should not be confused with hedge nettle, which is locally called mint in many places. (See Hedge Nettle).

Fig. 93. In Northern Michigan milkweeds grow abundantly over large areas and are the source of much surplus honey.

**MISSISSIPPI—Honey Sources of.**

Along the eastern border of the State there is a large area where sweet clover is widely disseminated. In this section large yields of surplus honey from this source are reported. An average yield of 140 pounds per colony of surplus from 700 colonies in one yard near Prairie Point has been reported to the author by a prominent Mississippi apiarist.

Willow, maple, fruit bloom and elm are reported as important for early pollen and nectar. White clover yields some honey in the northern part of the State. Persimmon is given as an important source of dark honey. Bitterweed yields freely, but the quality is so poor as to be of little value. Tupelo and cotton are valuable in some sections of the State. There is some fall honey from asters and goldenrod.

The coast region offers a vast area of gallberry and there is much titi along the streams. There are some very good unoccupied locations in Mississippi which offer great possibilities for honey production.

**MISSOURI CURRANT, see Buffalo Currant.**

**MISSOURI—Honey Sources of.**

White clover is the one principal source of honey in Missouri. Sweet clover yields surplus in some localities. In the low lands along the Mississippi River, heartsease, Spanish needle and boneset are also important. In many places south of the Missouri River, bitterweed yields some nectar, which is often mixed with the better honey and spoils the quality. Bluevine **(Gonolobus laevis)** yields surplus in a few localities. In the vicinity of Brunswick as much as 100 pounds of surplus per colony has been reported.

Only a small portion of Missouri is well suited to commercial beekeeping, owing to uncertainty of the honey flows. With the extension of the growth of sweet clover as a farm crop conditions are improving.

**MISTLETOE (Phoradendron flavescens).**

The mistletoe is too well known to need description. It occurs as a parasite on trees from southern New Jersey and Missouri south to Florida and Texas. It is a yellowish-green shrub, much branched, which grows on the branches of the trees to which it attaches itself. It flowers early, usually in February and March, and is frequently mentioned as a honey plant in the Southern States. Scholl lists it as the first source of nectar and pollen in Texas, blooming there in January and February. Many Texas beekeepers regard it as valuable for spring stimulation.

**MONARDA, see Horsemint.**

**MONTANA—Honey Sources of.**

The principal sources of nectar in Montana are alfalfa and white sweet clover in Yellowstone, Sun River, Missouri, Gallatin and Flat-Head Valleys; yellow sweet clover in Bitterroot Valley, White clover in Bitterroot and Gallatin Valleys, and fireweed in northwestern timbered region. Minor plants are willow, dandelion, Grindelia (gum-weed), etc.—H. A. Scullen.

**MONUMENT PLANT (Frasera).**

The monument plant is variously known as columbo, deer's ears (a translation of the Navaho name), and Frasera. It grows in high altitudes from 7,000 to 10,000 feet, from South Dakota westward to Montana and Oregon and south to New Mexico and California.

It has large, creamy blossoms, about two inches in diameter, on tall flower stalks growing to a height of three feet. (Fig. 94.) It is common in the Rocky Mountains and is much sought by the bees. According to Wesley Foster it is an important source of honey in May. It is a striking plant which once seen is not likely to be forgotten.

**MORNING-GLORY (Convolvulus).**

The morning-glory is a twining perennial vine of wide distribution throughout the United States. It has a large bell-shaped corolla and is often grown for ornament. Originally it was introduced from Europe

Fig. 94. The monument plant (*Frasera speciosa*) is a striking plant which, once seen, is not likely to be forgotten.

as an ornamental and has escaped and become naturalized in waste places, old fields and along fences everywhere. It is probably not important to the beekeeper anywhere, but Richter lists it as a honey plant at Sacramento, California, and Scholl lists it as yielding some honey and pollen in Texas.

At Victoria, Texas, according to M. B. Talley, morning glory yields surplus honey of fine quality in September. There it is called tievine.

**MOTHERWORT (Leonurus Cardiaca).**

The common motherwort is a weed introduced from Europe and Northern Asia. It is now quite generally naturalized from Canada to Florida and west to Louisiana. For some reason, it is seldom included in lists of honey plants, although it is said to be an excellent source of nectar. Reports of bees working on this plant very freely, in 1914, when most other plants failed to yield anything, were frequent.

The motherwort grows in clumps in waste places in old barn lots, along railroads, in factory grounds, etc. It grows from two to six feet high, with small flower clusters in the axils of the leaves. It is a relative of the catnip, and apparently equally attractive to the bees. This plant

Fig. 95. Clump of motherwort in barnyard.

was formerly used to some extent in medicine, especially for diseases of women. It is also known as lion's tail.

Figure 96 shows the blossoms and leaves, and Figure 95 a clump of the plants.

**MOUNTAIN LAUREL, see Laurel.**

**MOUNTAIN LILAC (Ceanothus).**

There are several species of mountain lilac common to California and the Western States. They are closely related to the buckthorns. (See Buckthorn). New Jersey tea belongs to this group. (See New Jersey tea).

Jepson lists fourteen species of **Ceanothus** common to California. They are shrubs or small trees with small but showy flowers, borne in umbels or panicles. The California species are mostly evergreen.

They are known by various names, as deer-brush, California lilac, mountain lilac, etc. One species is called buckbrush.

Some species are common to the Mountain States from Wyoming and Colorado to Arizona and west to Texas. Both honey and pollen are secured from this source, though there are probably not many places where surplus yields may be expected.

**MOUNTAIN MINT, see Basil.**
**MOUNTAIN QUEEN, see Yucca.**

Fig. 96. Motherwort in bloom.

**MUSTARD (Brassica campestris).**

Figure 97 shows the common yellow mustard **(Brassica campestris),** which is common all over North America and in Europe. The black mustard **(B. nigra)** also has a very wide distribution in Europe and America. There are about 50 species, including the closely related cultivated varie-

Fig. 97. Mustard in bloom.

ties of cabbage, turnips, rutabagas and mustard. All produce some nectar, and in some localities they are an important source of honey. In parts of California, notably the Lompoc Valley, mustard is grown commercially for seed; much honey is stored from this source. The honey is said to be light in color and mild in flavor. Apparently there is much variation in the amount of nectar, according to climatic conditions. In

any locality where it is sufficiently abundant, mustard can be expected to add something to the product of the apiary.

The late J. S. Harbison wrote, in his "Beekeepers' Directory,":

> "Mustard affords a larger amount of valuable pasturage to the acre than almost any other plant. It blooms throughout the month of May, and part of June. During this time, bees increase in numbers, and store from it large quantities of honey of a clear yellowish color, but partaking slightly of the taste of the plant."

# N

**NAPA THISTLE, see Star Thistle; also Centaurea.**

**NEBRASKA, Honey Sources of.**

Most of Nebraska's surplus honey is secured from clover, though alfalfa is important in the western part of the State, especially under irrigation. White clover, alsike and sweet clover are all important honey plants in Nebraska. Cottonwood furnishes an important source of pollen in spring. Willows and maples furnish both nectar and pollen, while fruit bloom and dandelions are usually sufficient to enable the bees to build up for the clover flow. There is a great variety of minor sources which are not sufficiently abundant to yield much surplus. Among these may be mentioned, milkweeds, catalpa, Rocky Mountain bee plant, buffalo bur, vervain, Spanish needles, etc.

Heartsease yields abundant surplus some years and basswood was formerly important in some places in eastern Nebraska.

**NECTAR AND NECTAR SECRETION.**

The great Swedish botanist, Linnaeus, nearly two hundred years ago, basing his classification of plants on their flowers, found it necessary to name and account for all of the parts of a flower. In many cases he found structures that were neither sepals, petals, stamens nor pistils, and as these contained, or were wet with, a sweet fluid, he gave this the fanciful name "nectar"—the drink of the gods, and called the parts of the flower that produced or contained it, "nectaries."

As these nectaries were different from stamens and pistils, which Linnaeus recognized as the sexual organs of flowers, though they are sometimes connected with them, and as they were different from ordinary sepals and petals, though sometimes connected with them, they presented something of a question to the men of that day, who were curious to know what the parts of a plant really are and what they do. For this reason the study of nectaries became something of a popular diversion for a generation or two; and a general idea that they are organs for secreting sugar became established; not necessarily an idea of secretion,

though, for just as animals excrete various organic substances that are by-products, or waste, from some of their functions, so it was thought by some students that the sugar or nectar might really be an excreted waste or surplus rather than a substance secreted because it is to become useful to the plant.


Fig. 98. Sprengel's title page.

Toward the end of the eighteenth century a German rector, Sprengel, who seems to have found in nature a good deal of inspiration that he failed to "put over," noticed that the petals of the common German wild geranium were fringed with hairs at their bases. That was in the day before men believed in evolution, but when they did believe in a purposeful

creation. Sprengel was convinced that an all-wise Creator would not have made a single hair in vain, and he set about discovering what these hairs were for, much as a sensible person, seeing the governor on an engine today would try to find out what it is for. Below the break between the petals, he found a nectar gland, producing its sugary fluid; and he saw the hairs would prevent the nectar from being diluted or washed away by rain or dew. This brought him back to the original question—what nectaries and nectar are for. He got his answer to this by watching the plant and seeing that bees visited the flowers and removed the nectar as what might be called the raw materials of the honey industry.

In Sprengel's day the general impression was not only that things have been created just as we find them, but created for our own ultimate good. So Sprengel found an answer in discovering that the hair fringe of the geranium petals protects the nectar of the flowers and so preserves it for bees to use in manufacturing honey for our breakfast table.

When you stop to think about it, Sprengel could hardly have had the curiosity to study out his geranium question to an answer without being spurred to look at other flowers to see if they might not have something interesting of the same sort to offer. He yielded to the impulse to look at other flowers, and he found his geranium to be a very drab specimen compared with some of the irregular and painted flowers that he studied out in the same way. He must have felt no common pride when, in 1793, he published the results of his studies, with simple but effective illustrations, under a title that meant revealing to mankind the newly discovered secret of nature in the structure and fertilization of flowers.

But Sprengel seems not to have been the sort of man to whom such an answer really was an answer, and he looked further. It does not seem to have taken him long to see that while gathering their own store of honey, and obviously without consciousness that they were doing anything else, the bees became dusted with pollen from geranium stamens and rubbed it off on geranium stigmas while going their rounds of the flowers. This conclusion evidently answered two questions—what the hairs are for, and what nectar is for.

It is not necessary to walk down Michigan Boulevard on a windy day to realize that we belong to an imitative race. The corner grocery and the drug store show it as well as the windows of milliners and dressmakers, shoe shops and news stands, or as the sights that issue from a barber shop in a college town.

Fashions run in fads and interests quite as much as in dress. Linnaeus was a great botanist; perhaps none has been greater. He not only reduced a chaotic science to order, but interested men in its study to a remarkable extent. It is rather unfairly charged against him that because his service was somewhat one-sided, those whose interest he awakened were extremely one-sided, in that they did not see or care for much in botany beyond finding, describing and classifying new plants. This was well enough worth doing; it is not finished yet, and will not be finished for many years to come; but it had become so fascinating and workable

through the genius of the Swedish master that his followers seized on it with eagerness, and it was a long time before a mind of original habits and impulses broke loose from the train.

The man who possessed this originality was Darwin, the promulgator of the now universally accepted idea of organic evolution. To him has been ascribed the introduction of a new teleology into natural science, recognizing that structures and functions **are** because they are or have been of use—not of use to man necessarily, though man may turn them to account—but to their possessor.

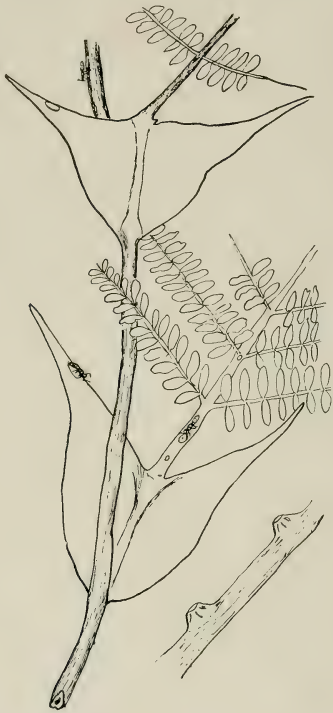


Fig. 99. Ant acacia

This was Sprengel's conclusion as to the nectar of geranium flowers, which he found led to their fertilization. The essential difference between his way of seeing it and Darwin's is that he thought the entire mechanism has been specially made by the Creator as a means to an end, while

Darwin saw in it the gradual modification of earlier structures because the new were helpful in the struggle of life and their possessors for this reason were likely to survive and pass them on to their offspring.

There is a German country saying that the honeybee was forbidden the red clover because she didn't keep Sunday. Beekeepers know that her tongue is a little too short for the honey tube of the red clover flower and that she doesn't waste time in trying to get what is out of her reach. They know, too, that some races of honeybees really can suck the red clover nectar because they have longer tongues, and if beekeepers ever want to do it they can probably set an expert plant breeder to work at breeding a race of red clover with a tube short enough so that even the German honeybee can get at its nectar. Natural evolution hasn't done this. Where red clover is at home bumblebees are found, and bumblebees have no difficulty in reaching its nectar much as hawk-moths get that of a moon flower, which is far beyond the reach of any kind of bee. But in the South Seas, where there are no long-tongued bees, red clover finds itself as unable to set seed as the German honeybee is to get at its nectar. Bee and flower have evolved together, where both are at home, into a harmony of structure that is helpful to them both.

Nothing was more suggestive to Darwin in his search for evidences of evolution, or modification through descent, than this sort of harmony of structure and habit in flowers and insects; and one of his earliest and most effective books in bringing his views to the comprehending notice of others was one dealing with the mutual relations between those freaks in flowers, the orchids, and their insect visitors.

For Sprengel's teleology, Sprengel's explanation of nectar as a means of securing fertilization was sufficient. For Darwin's teleology, it carried another question: **Why?** The geranium flower has both stamens and pistil, standing in its middle. The one might fertilize the other just as well as not, apparently; and yet this does not happen, for the pollen-bearing anthers of the stamens drop off before the stigmas of the pistils come to maturity. The same thing may be seen on any single-flowered geranium in a bay window or a greenhouse or a summer window box or flower bed, only this geranium does not belong to the genus **Geranium** of the botanists, but to the related African genus **Pelargonium.**

Looking for a further reason, Darwin saw a step further into the mystery when he found that these and many other flowers that ought to get on without any help are as dependent upon insects through their own failure to bring pollen and stigma together as those are in which stamens and pistils are borne in separate flowers—often on separate plants. To him, nectar and its attendants—flower fragrance, color, variegation, bizarre shape, long tubes, nectar guards of hairs or some other structure—meant what they had meant to Sprengel, fertilization through insect aid; but they meant something more, fertilization of one flower by pollen from another flower—crossing.

And still the questions multiply. Why do not all flowers have stamens and pistil side by side? Why, when they have this structure, do

they not time the maturity of these essential parts so as to secure effective functioning without all the nectar machinery? In other words, **why** is crossing so commonly necessitated and provided for?

Science of every kind has been advanced by three methods—reasoning, observation, experimentation. Sprengel's answer was reached by the first two; the new answer sought by Darwin was to be obtained through the third. For eleven years he put the question direct to the plants themselves, fertilizing them by their own pollen, crossing them, raising and requestioning their offspring. More and stronger progeny from crossing was the answer.

The popularity that Linnaeus had given to characterizing and classifying living things, was transferred by Darwin to studying their structure and doings. Sprengel's idea fell upon barren soil; Darwin's was cultivated with care and skill.

Two men—Mueller, a German, and Delpino, an Italian, stand out most prominently among a multitude who observed and wrote and pictured the marvels of flower and insect harmonies for a generation. All did excellent work in furnishing details and corroborations; but Darwin had answered the question as to the what and the why of the nectar of flowers.

But there is nectar that is not produced in flowers. Look at the queer spots in the angles between the veins on the under side of a catalpa leaf, when it is young; or at the little goblets on the stalk of a cherry or peach or snowball leaf, or at the pin-head spots on a trumpet-creeper or paeony calyx, and you may see glands there that secrete a sweet fluid. Bees may not care for it, but wasps or ants do. The cotton plant has such sweet nectar glands on the outside of the cluster of bracts about each blossom, and on the back of its leaves.

In a very few cases such "extrafloral" nectar serves the same purpose as that within the flowers; but generally it does not lead to fertilization. Delpino called the nectar that leads to fertilization "nuptial" nectar, and the other "extranuptial."

In the seventies of the last century an English mining engineer, Belt, well known in the ore regions of Colorado, was marooned by his profession on a mining property in Nicaragua. Using his eyes took the place with him of tennis, or of dissipation, which is the white man's bane in the tropics. He saw that a certain kind of ants cut the leaves of trees into bits which they take into their nests, and that roses and other introduced plants fared hard with these leaf cutters, unless they were protected by aromatic oils, as various kinds of citrus leaves are, or in some other way.

Belt did not fail to notice that ants visited extrafloral nectaries in numbers. In the case of those on some acacias he found the ants very pugnacious. I confess that in Guatemala I have preferred, myself, to go around a bush or a grove of such acacias with their ant guards. As with Sprengel's geranium hairs, these nectaries unfolded question after question.

In Belt's case, the tips of the acacia leaflets ripen also into little fruitlike bodies that the ants gather and take into their nests; and they

make these nests in the stipules that flank each leaf and sometimes are shaped like a pair of small buffalo horns. It is an interesting undertaking to get the ant census of an acacia twig of this sort. The danger may not be as great, but it is as real and perhaps as painful as in taking the census of a mountain valley noted for moonshine traffic.

Belt drew the conclusion that extranuptial nectar, sometimes supplemented by solid food and shelter, is of use to the plant that provides it by maintaining a bodyguard of ants on plants that otherwise would be defoliated and injured by leaf cutters or grazing animals, much as Sprengel and Darwin found an explanation of nuptial nectar in the benefit of insect pollinization of the flowers.

This is the simple story of nectar, simply told, as it has been seen by observing and thinking men. But it is not a story free from complications. Our blue violets rarely set fruit from their showy nectar-bearing flowers, but their main reliance for seed is on flowers produced below the leaves, and these do not open, but are self-fertilized. The beautiful **Poinsettia,** with its brilliant red bracts and large cups overflowing with thick nectar, does not fruit in West Indian gardens any more than it does in our greenhouses at Christmas time. And irresistibly pugnacious as the acacia ants are, those that visit our paeonies and cassias and other plants do not usually more than protest mildly if we molest the plants that they are on.

Are the explanations of Sprengel and Darwin, and of Belt wrong? No other that are at all satisfactory have been offered.

When one stops to think of it, the secretion of nectar is an ususual phenomenon. Sugar is made within plants and it does not leak from them unless they have been injured. The sugar beet takes various substances out of the soil water, but it does not permit the passage of sugar into the soil water. And yet nectar, essentially sugar, is passed out of the plant, within which it was manufactured. This is because it is secreted—or excreted—through specialized glands. Everyone who grows plants in a bay window has seen young clover or grass leaves with a drop of water on their tips at some time or other. A few grains of bird seed in a flower pot covered by a pane of glass will show this as quickly as the seedlings come up.

These drops pass out finally through pores; but they are drops of water and not of nectar. If we can imagine a gland behind such a water pore, secreting sugar—letting it really get out of the cells with or into the water, we can picture a nectar gland. Such glands occur in some flowers. Some botanists believe that extranuptial nectar glands were originally water glands that have acquired the habit of secreting sugar.

This habit is a very unusual and a very peculiar one. It is not really understood except as it may be connected with usefulness to the plant. If this usefulness is not indirect, in the ways suggested by Darwin and Belt or otherwise, it must be direct. Water glands relieve over-pressure when absorption is high and evaporation low; in some of the calla family the water even spurts from the tips of the leaves at times. But sugar is not like water, taken in in quantity and to spare; it is manufactured, and in the case of nectar glands it is manufactured where it is secreted. Nobody has yet suggested any physiological function of plants calling for sugar

safety valves situated in the queer positions occupied by extranuptial nectar glands, and no satisfactory direct physiological explanation of the nuptial glands has been suggested.

The actual status of nectar in botanical science is about this: When it is produced in flowers, and in some cases when it is outside of them, but near them, it demonstrably serves to secure cross-pollinization through the aid of insects, or humming birds and their like, when the flowers are long, tubular and red, as in the trumpet creeper, the trumpet honeysuckle and the scarlet salvia. It is then "nuptial nectar." When it does not serve the plant in this way and so is "extranuptial," it occurs in the neighborhood of the flowers, as in cotton, sweet potato, trumpet creeper and paeony, where it attracts numbers of ants, which are often very pugnacious, and to the extent of their activities it prevents injury to the flower buds and flowers, especially in their early stages; or it occurs on developing leaves during the period of their greatest need. More rarely, as in the acacias, the leaves continue to secrete it through the season, so that those that are mature add to the protection of the younger leaves and the flowers and the young fruit.

That neither of these functions is served in exceptional cases, and that some flowers rely on the wind for effective pollination, or have lapsed into self-fertilization; or that really pugnacious ants do not commonly frequent the extranuptial glands of most plants in temperate regions, and that some plants get along very well without such help, mark questions that will continue to stimulate observation and experiment. But nothing now known of the physiology of plants offers an alternative explanation for that which connects nectar with either pollination or defense; and until such an explanation can be found nectar will continue to be regarded as connected indirectly with these services through insect or bird relations.—William Trelease, Botanist, University of Illinois. American Bee Journal, Dec., 1919. (See also Physiology of Nectar Secretion).

**NEGUNDO, see Box Elder.**

**NEVADA—Honey Sources of.**

Much of Nevada is mountain and desert country. Alfalfa is the principal source of surplus honey, though sweet clover also yields. There are numerous minor sources, as willows along the streams and many of the desert plants.

**NEW BRUNSWICK—Honey Sources of.**

In New Brunswick the principal sources of nectar are alsike and white clover, fireweed, goldenrod and aster. Willows and maples stimulate early brood rearing.—F. W. L. Sladen.

**NEW HAMPSHIRE—Honey Sources of.**

The honey flora of New Hampshire is very similar to that of other New England States. In spring, willows, maples, fruit blossoms and dandelions keep the bees busy in preparation for the main flow, which comes from the

clovers. Goldenrod is also important. Sumac, laurel, blueberries and asters are worthy of mention, also.

**NEW JERSEY—Honey Sources of.**

Plants from which nectar is gathered in less than surplus quantities:
Maples, mid-March-early April.
Peach early April.
Pear, mid-April.
Apple, late April early May.
Willows, late April.
Dandelion, early May.
Wild strawberry, May.
Lupine, May.
Raspberry, May.
Grape, late May-early June.
Huckleberry, blueberry, late May-late June.
Persimmon,mid-June-late June.
Vervain, late June-early September.
Virginia creeper, late June-late July.
Milkweed, silkweed, July.
False indigo, July.
Button bush, July.
Burdock, July-October.
Tree of Heaven, pride of China, July.
Catnip, July
Motherwort, August.
Smartweed, heartsease, late August-mid- September.
Horsemint, August-September.
Boneset, mid-August-September.

Surplus honey plants:

Crimson clover, mid-May.
Locust, May 20-June 1.
Tulip-poplar, May 26-June 10.
Poison ivy, mid-May-mid-June.
Holly, late May-late June.
Mountain laurel, late May-late June.
Sheep laurel, late May-late June.
Swedish clover, alsike clover, June 1-July 10.
White clover, early June-mid-July.
Dogbane, Indian hemp, early June-late August.
Basswood, linden, late June-early July.
California privet, mid-July-late July.
Sumac, mid-June-mid-July.
White sweet clover, June-November.
Cranberry, June 15-August 15.
August flower, soap bush, sweet pepper bush, late July-late August.

Rose mallow, swamp mallow, late July-early September.

Burdock, July-November.

Spanish needle, mid-August into October.

Heartsease, smartweed or blackheart, August-September.

Heath aster, white aster or St. Michaelmas daisy, late August-mid-October.

Bushy goldenrod, late August-mid-October.

Buckwheat, early August.

**Surplus Honey Regions**

We may divide the State of New Jersey into three sections on the basis of surplus honey production.

The first section includes all of the southern and middle counties and the southern part of Middlesex, Somerset and Hunterdon. As a rule, the surplus honey in this district comes from clover. There are, of course, occasional places, such as low-lying land along large streams where a second flow is harvested in late summer and early autumn.

The second district includes all north of the first, with the exception of Hudson County and a part of Bergen, Passaic, Essex and Union. In this district there are generally two distinct, heavy honey flows, the first from clover and the last from buckwheat and fall flowers, such as goldenrod, aster, etc.

The third division, which roughly includes the Passaic and Hackensack Valleys, and the Raritan Valley below New Brunswick, rarely produces any surplus honey except in the fall, and that comes from goldenrod, aster and mallows.

The presence or absence of a single kind of plant will often decide whether the fall flow will be worth consideration. This principle applies more particularly to the second district. Should the amount of buckwheat sown be very small in some parts of this region the fall surplus would be missing. In certain parts of this second district white sweet clover is found in great abundance and furnishes surplus throughout the late summer and early fall.—Elmer G. Carr, Manual of Bee Husbandry.

**NEW JERSEY TEA** or **RED-ROOT (Ceanothus americanus).**

New Jersey tea grows from one to three feet high from a dark red root, hence the name "red-root." It is a shrubby plant with flowers in white clusters. The leaves were used for tea during the revolutionary war. It is common in woodlands from Ontario to Manitoba and south to Arkansas, Texas and Florida.

It is not often mentioned as a source of honey, but according to H. B. Parks, is regarded as valuable in northwestern Missouri. (See Mountain lilac.)

**NEW MEXICO—Honey Sources of.**

Alfalfa is the chief source of surplus honey in the irrigated regions of New Mexico. There are some districts where the bloom of orchard fruits is important, especially for spring stimulation. The desert flora offers a wide variety of minor sources, with a few of surplus importance,

Among the latter may be mentioned mesquite, catsclaw and cactus. (See Arizona and Texas.) Sweet clover is also important.

**NEW YORK—Honey Sources of.**

W. D. Wright, in Bulletin 49 of the New York Department of Agriculture, only lists a few plants as important in that State. He mentions basswood as formerly one of the principal sources now rapidly passing away. Alfalfa is mentioned as a source of honey in central New York. Alsike is spoken of as abundant and a splendid honey producer. Good yields are frequently gathered from buckwheat in sections where it is grown extensively and it seldom fails entirely. Fruit blossoms and black locust bloom before the colonies are sufficiently strong to store much surplus, but are valuable for early brood rearing. Sweet clover, sumac, blue thistle and goldenrod are the other sources mentioned. The failure to mention white clover is evidently an oversight, since it is one of the most important sources of nectar in the State.

**NORTH CAROLINA, Honey Flora of.**

Taking the State as a whole, sourwood, poplar, sometimes called tulip tree, and the clovers, are the three leaders. Of these three leaders the poplar is the most widely distributed and is prominently mentioned in all sections, from east to west. The sourwood is principally confined to the Piedmont section, though reported also from the lower mountain localities and from the western border of the eastern region. The clovers are found in all parts, though more abundant in the mountain and Piedmont sections. Next to these we find the gallberry **(Vaccinium sp.)** and black gum, both taking high rank and both found principally in the east. Persimmon ranks sixth and is reported principally from the east, several mentioning it as irregular in yield and lasting but a short time, but doing well for a short period. The basswood or linden comes seventh and is reported only from the west. Holly and huckleberry (low and high) are next in order, both being in the east. Buckwheat follows and is confined to the west.

Twenty-four leading bee pasturage plants:

Sourwood, Piedmont; little east and west.
Poplar (tulip tree), all sections.
Clovers (all varieties), west and Piedmont; little in east.
Gallberry, east.
Black gum, east.
Persimmon, east and Piedmont.
Basswood (linden, linn), west.
Holly, east.
Huckleberry, east.
Buckwheat, west.
Ironweed (aster), Piedmont.
Locust (black locust), west and Piedmont.
Aster, all sections.
Cotton, east and Piedmont.

Stickweed **(Bidens).**
Fruit trees, all kinds, all sections.
Peas (cow peas), Piedmont and east.
Sumac.
Nut trees (including oak), all sections.
Goldenrod, all sections.
Rattan, east.
Blackberry, all sections.
Maple ,all varieties), all sections.
Alfalfa, locally grown.

—Franklin Sherman, Jr., Bul. North Carolina Department of Agriculture, Vol. 29, No. 1.

**NORTH DAKOTA—Honey Sources of.**

Beekeeping is, as yet, but little developed in North Dakota. Willows and cottonwoods furnish early pollen, dandelion and fruit bloom assist the bees with both nectar and pollen for early brood rearing. The clovers are the principal sources of surplus honey.

**NOVA SCOTIA——Honey Sources of.**

Willows and maples are important for spring brood rearing. The sources of surplus are alsike and white clover, goldenrod, aster, apple, fall dandelion **(T. autumnale),** wild radish **(R. Raphanistrum),** blueberry and **Kalmia angustifolia.**—F. W. L. Sladen.

# O

**OAK (Quercus).**

The oaks are frequently reported as sources of nectar. The fact is that it is usually honeydew, rather than nectar, which the bees gather from oaks. Pollen is produced in abundance by these trees and all species may be regarded as valuable for pollen. (Fig. 100.) There are many species of oaks, some of which are common to any part of America where trees grow naturally. There are 24 species recorded from Alabama, 24 from New Mexico and 12 from Connecticut.

Richter gives 4 species—field oak **(Quercus agrifolia),** tan bark **(Q. densiflora),** mountain white oak **(Q. douglassii)** and weeping oak **(Q. lobata),** as sources of honey in California. Scholl gives 6 species as sources of honey in Texas, as follows: Post oak **(Q. minor),** live oak **(Q. virginiana),** red oak **(Q. rubra),** Spanish oak **(Q. palustris),** water oak **(Q. aquatica),** and jack or barren oak **(Q. nigra).**

H. B. Parks, of the Texas Agricultural College, has found that post oak yields some nectar from extra floral nectaries. This may be true of some other species.

The live oak yields honeydew in large quantity in west Texas, from

the balls made by the live oak gall. George Schmidt, of Crystal City, reports an average of 25 pounds per colony from live oak balls, on the Nueces River, in 1917. The honey was dark and heavy, but of good flavor. The flow lasted till frost. There are numerous similar reports, from west Texas, of honeydew from this source, from August till late fall. During the drought of 1917 and 1918 there was little else for the bees in many Texas localities, and the live oak saved the bees from starvation.

Occasionally the bees work on white oaks in Illinois. In this case they are attracted by the presence of a soft scale **(Lycanium cockerellii).**

Fig. 100. Pollen bearing blossoms of red oak.

### OGECHE PLUM, see Tupelo.

### OHIO— Honey Sources of.

The sources of nectar in Ohio are very similar to those of many other States in the great central basin, where white and alsike clover furnish the principal surplus. There is the usual list of plants furnishing nectar and pollen for early spring, such as willows, maples, fruit blossoms, dandelions, etc. The main flow comes from white and alsike clover in June and July. In some sections buckwheat yields surplus. Basswood, which was once an important source of nectar, has been cut until few beekeepers

are able to get crops of much value from it. Goldenrod and asters are important in many sections for late fall.

**OKLAHOMA— Honey Sources of.**

Fruit blossoms furnish nectar and pollen for early brood rearing. Dandelions and willows are also important at this season. Cottonwood yields pollen abundantly, as do other shade trees. Alfalfa horsemint, horehound, sweet clover and cotton are important sources of surplus.

Among the many minor sources may be mentioned Indian currant, button bush, asters, goldenrod, milkweeds, melons, etc.

**OKRA or GUMBO.**

Cook's Manual lists okra as a honey plant. It is a well-known garden vegetable, especially popular in the South, but is seldom grown in quantity sufficient to be important to the beekeeper.

**OLEASTER, WILD OLIVE, RUSSIAN OLIVE (Elaeagnus hortensis).**

The Russian oleaster, known botanically as **Var songorica** (Fig. 101) was first introduced into this country by Professor J. L. Budd because of its hardiness and ornamental qualities. The young trees branch freely

Fig. 101. Oleaster or Russian Olive.

and produce an abundance of white, scurfy foliage, which makes it a most attractive and striking shrub. * * * It is one of the most fragrant of cultivated small trees. The season of blossoming varies somewhat, but with us (Iowa) is about the middle or early part of June.

It is one of the best of our spring honey plants. The bees visit the

plant in large numbers when in full bloom from early morning until late evening.—L. H. Pammel, American Bee Journal, November, 1917.

**Eleaegnus argentea,** wolf willow or silverberry. It is said to yield honey on the prairies.—W. J. Sheppard, British Columbia. American Bee Journal, November, 1917.

**OLIVE (Olea europaea).**

The olive is generally cultivated in orchards throughout California. Richter states that his bees, within easy reach of several thousand olive trees, do not work on them, but that T. O. Andrews, of Corona, and B. B. Hogaboom, of Elk Grove, report bees working well on olive bloom. He further states that the olive tree is a well known source of honey in Spain.

**ONION (Allium).**

According to Richter, wild onions sometimes yield surplus honey in the vicinity of Sacramento, California. In some parts of that State, where cultivated onions **(Allium cepa)** are grown for seed, they are also important. The onion yields freely and the honey is said to be amber in color with a characteristic onion flavor which disappears after the honey is fully ripened. There are few localities where onions are sufficiently abundant to be important.

**ONTARIO—Honey Sources of.**

The principal honey plants of Ontario, in the order of their importance, are alsike and white Dutch clover, buckwheat, basswood, fireweed, wild raspberry, goldenrod, aster, dandelion, sweet clover, viper's bugloss, Canada thistle, milkweed and boneset.

Buckwheat, basswood, sweet clover, viper's bugloss, milkweed and boneset are confined principally to the southern part of the province. Willows and maples are important for early spring brood rearing.—F. W. L. Sladen.

**OPUNTIA, see Prickly Pear.**

**ORANGE (Citrus aurantium).**

The orange tree is a native of Asia, early introduced by the colonists into Florida. It thrives in a semi-tropical climate and its culture in America is confined to southern Florida, a few small areas along the Gulf Coast, the lower Rio Grande Valley in Texas and to California. It is sensitive to frost and the trees are easily killed by freezing.

In California, orange is one of the important sources of honey. The trees bloom in April, when many colonies are too weak to make the most of the crop. The flow is extremely rapid, as at times the nectar is secreted in such abundance that men and horses working in the orchards are saturated with it. The flow lasts about three weeks. In 1919 it continued 23 days in Tulare County. Four hundred colonies in one yard averaged more than 60 pounds per colony from orange. O. F. Darnell, of Porterville, extracted 171 pounds of orange honey from one colony in ten days, after having previously extracted 24 frames which were not weighed. A.

W. Gambs, of Anderson, reported that some colonies, made extra strong by drifting bees, stored four full-depth extracting supers of fresh nectar from orange in four days.

In some of the interior valley locations the bees get fair crops from orange about four years in five. Along the coast, the fogs are unfavorable and the crop is uncertain. Good orange locations are much in demand, and many beekeepers move their bees long distances for the flow. With a larger reserve supply of honey, left in the hives for winter to enable the bees to build up early in spring, and with more careful attention to wintering, it would be possible to greatly increase the average returns from orange. This statement is based on the results of a few beekeepers who take special pains to get their bees into condition for the orange flow.

The honey from orange is white in color, heavy in body, of the finest quality, and is much in demand in the markets.

**OREGON CRAB APPLE, see Crab Apple.**

**OREGON—Honey Sources of.**

J. W. Wills, of Marion County, Oregon, lists the principal honey plants of that State in the American Bee Journal as follows:

Willow, chickweed, balm-of-Gilead, salmonberry, dandelion, fruit trees, grapes, currants, gooseberries, maples, clover, Juneberry, barberry, huckleberries, laurel, milkweed, lobelia, catnip, snowberry, arrowwood, Spanish needle and some others.

P. W. Nicolle, in Gleanings, adds that chittam **(Rhamnus purshiana)** is one of the principal sources. He mentions, also, salal **(Gaultheria shallon)** as a source of nectar. Salal is frequently mentioned as valuable in Oregon.

**OREGON GRAPE (Berberis nervosa).**

Oregon grape is common in the woodlands near the Coast from Marin County, California, northward. It is abundant in the forest regions of Washington. It is a shrub with prickly alternate leaves and yellow flowers in racemes. Oregon grape is reported as a source of honey of minor importance in the Northwest. Like the agarites or triple-leaved barberry of Texas, it blooms in early spring when it is of special value for stimulative purposes. Another species of barberry **(Berberis Aquifolium)** is common to this region, and most beekeepers do not differentiate between the two species. (See Barberry.)

**OREOCARYA.**

A desert plant growing on high, loose, sandy soils. Blooms in May, with a small bur following the bloom. It ranges from Wyoming to Arizona and west Texas. It yields nectar freely and an average of forty pounds per colony has been reported from this source. The honey is light amber, of inferior flavor, according to D. W. Spangler, of Longmont, Colorado, but it is extremely valuable for building up colonies in spring. Extended cultivation is rapidly reducing the area where the plant is to be found.

# P

**PALM.**

Royal palms **(Roystonea regia)** are very abundant in Cuba and Porto Rico and are probably the most characteristic trees of those islands. They are also to be found to some extent in the southern portions of the United States. As sources of honey these trees are important in the West Indies, where they yield nectar abundantly.

The date palm **(Phoenix dactylifera)** has been planted to a limited extent in the desert regions of the Southwestern United States. This species is reputed to be a splendid source of nectar.

The cocoanut palm **(Cocos nucifera)** is the most important of all the palm trees, since the nuts furnish large quantities of food, much used in tropical countries. This species is common in the West Indies and in southern Florida. Although the source of considerable honey it is not equal to the foregoing species as a source of nectar. (See also Palmetto).

**PALMETTO (Sabal).**

The palmettos are the most conspicuous feature of the flora of the south half of Florida. (Fig. 104.) The cabbage palmetto is a tree, while the saw or scrub palmetto grows more like the underbrush in northern forests. To the man accustomed to dense forests, the open, park-like growth of the palmettos hardly seems like woodland. The illustration gives a good idea of the typical Florida landscape.

This group of plants is not important in America, outside of the State of Florida. A small area in lower Texas, about the mouth of the Rio Grande River, is covered by a species of palmetto closely resembling the cabbage palmetto, but it is thought to be a different species. An occasional tree is also found along the seacoast as far north as Charleston, S. C. They are to be found also as street trees in various southern cities along the Gulf Coast and in south Texas. The small saw palmetto **(Serenoa serrulata)** also extends its range into Georgia and the Carolinas, in open pine woodlands.

In Florida both forms are sufficiently abundant to furnish nectar in quantity worthy the attention of the commercial beekeeper. However, in too many localities there is little else available, so that the season between flows is too long to make beekeeping worth while. To take advantage of the palmetto flows and at the same time get good crops through the rest of the year, the late O. O. Poppleton practiced migratory beekeeping. His apiaries were moved several times during the year, so as to be near different sources in the period of bloom. The great drawback to beekeeping in Florida is the lack of a sufficient variety of honey plants in one loca-

tion to support the bees profitably throughout the year. There are a few localities, of course, where this does not apply.

The cabbage palmetto **(Sabal palmetto)** (Fig. 102) gets its name from the cabbage-like formation in the bud at the top of the growing trunk. The tree grows 25 to 35 feet in height and has large fan-shaped leaves

Fig. 102. Cabbage palmetto in bloom.

several feet long. It grows along the Atlantic Coast to the north line of Florida, but in the interior is not found in abundance more than about two-thirds of the way.

The tree blooms during July and August, the latter date applying to northern parts of the State. The blossoms are very delicate and have been likened by Professor Baldwin to a giant ostrich plume. (Fig. 105). According to his statement, the flowerlets are sensitive to weather condi-

Fig. 103. The saw palmetto in bloom.

tions. Too much moisture blights them, while the opposite extreme blasts the delicate bloom. As a consequence, it does not yield abundantly more than about one year in three, although at times it yields very profusely.

> "On the St. Lucie River, Mr. Hill extracted, barreled and shipped 3,500 pounds of palmetto honey from 55 colonies in two weeks."—Page 489, American Bee Journal, 1899.

While palmetto honey is regarded as of very high quality, the honey from the cabbage tree is rather thin and requires some care in getting it properly ripened, as the following quotations will show:

> "Cabbage palmetto honey, sealed or unsealed, will foam as though fermentation was in progress; that taken from the combs unsealed will ferment enough to deprive it of all the honey flavor, but the sealed only foams. Thin and acid and amber in color, it will flow bubbling from the cells behind the knife, and it is not a rare thing to see gas bubbles under the cappings of the sealed cells. Whether the colonies are strong or weak, it is always the same, when the bees work on the cabbage trees, as the common palm tree of Florida is called. The name

comes from the fact that the bud in the head at the top is eaten in lieu of cabbage.

"The saw palmetto is decidedly different in the nectar it yields. Saw palmetto honey, even unsealed, may be called a good honey, and it is, too. When ripened it is a honey that makes a name for itself when enough care is taken by the producer to have it unmixed with other nectars.

"I write from personal experience on the east coast of Florida."—L. K. Smith, Gleanings, page 39, 1909.

Fig. 104. The palmettos are a conspicuous feature of the Florida landscape.

The saw palmetto **(Serenoa serrulata),** often called scrub palmetto (Fig. 103), is a low growing little palm, found on dry soils in the Gulf Coast region. In the southern portion of its range, in peninsular Florida, it attains the proportions of a small tree. There it sometimes reaches a height of 20 feet, with erect or inclined trunk. Further north the stem is almost invariably underground. Large areas of pine lands are covered with it.

The blooming time is April and May. O. O. Poppleton wrote concerning his calendar of the year:

"April—Saw palmetto flow commences early in the month and continues until last of May. Our apiary work these two months is extracting, building up all colonies and replacing poor queens."—Beekeepers' Review, page 11, 1893.

Concerning the honey flow from saw palmetto we quote E. G. Baldwin as follows:

"The honey from saw palmetto is lemon-yellow in color, thick and


Fig. 105. Bloom of the cabbage palmetto.

waxy and of pronounced but delicious flavor. It is not quite so transparent as pure orange honey, but seldom candies, and makes a choice table article. Mr. O. O. Poppleton pronounces it the best honey in Florida, with the possible exception of tupelo. It is liked by almost everyone at first taste; is a trifle milder, even, than orange."—Gleanings, page 177, 1911.

Forest fires frequently destroy many square miles of the saw palmetto, thus removing this source of nectar for one year. However, according to Baldwin, the burned-over portions usually produce the most honey the following year.

Concerning the flow from palmetto, E. B. Rood, of Bradentown, writes as follows:

"We have been having the heaviest honey flow from palmetto for ten years. One colony on scales brought in 50 pounds in four days, and 80 pounds in ten days. I expect 20,000 to 30,000 pounds. I have extracted 13,000 pounds now and am just starting on another round."—Gleanings, page 703, 1908.

Fig. 106. Partridge pea.

**PARADISE FLOWER,** see **Acacia.**

**PARSNIP (Pastinaca sativa).**

The cultivated parsnip is a valuable honey plant. In the seed belt of California, where it is grown largely for seed, it is important as a source of surplus. Writing in Gleanings (November, 1919) E. R. Root mentions having seen hives five and six stories high, jammed full of honey from parsnip and celery. He states that the honey is not of the best, and that honey from parsnip is inferior to that gathered from celery.

**PARTRIDGE PEA (Cassia Chamaechrista).**

Partridge pea, known also as sensitive pea, is an important source of honey in Georgia and Florida. The flowers, of an attractive yellow color, are about the size shown in Figure 106, which displays blossom, seedpod and leaf. This plant is common along sandy roadsides in the Middle West, and may at times be found for miles at a stretch. It is seldom reported as an important source of surplus honey, except in the Southeastern States. While the bees visit it freely while in bloom in the Northern States, the honey stored from this source is seldom noticeable.

The plant is peculiar in that in addition to the flowers, nectar is secreted by extra floral nectaries at the base of the leaf stalk or petiole. The bloom lasts for several weeks in midsummer. As the bloom comes for the most part after the close of the clover harvest, its chief value in the North is to keep the bees occupied till the later flowers furnish a fall flow. The quality stored from this source is reported as poor in the North.

In contrast, the following report indicates that it is valuable in Georgia and Florida:

> "Bees store from one to three supers, during its flow, of light honey. The flow begins in June and lasts until October."—Wilder *in* American Bee Journal, page 369, 1912.

**PEACH (Prunus persica).**

The cultivated peach is an important source of nectar over a wide scope of country. In localities where large peach orchards are found, it is important for building up colonies in spring. Like most of the tree fruits, the blooming period comes early, before the bees are strong enough to profit to the fullest extent from the abundance of nectar.

**PEAR (Pyrus).**

The cultivated pear is old-world origin, but now widely distributed in America. Where grown commercially, it is the source of abundant nectar and pollen in early spring. Most varieties of the pear bloom ahead of the apple. Nearly all the tree fruits furnish nectar in abundance and all are valued highly by the beekeeper.

The pear is subject to blight, which destroys thousands of trees every year. For a time the honeybee was accused of spreading the blight by her visits from tree to tree. There is now serious doubt whether it is possi-

ble for the bee to spread this disease. Experiments by Dr. J. H. Merrill, at Kansas Agricultural College, indicate that the aphids are the carriers of the infection.

**PENNSYLVANIA—Honey sources of.**

Pennsylvania is in what is generally known as the white clover region. White and alsike clover are of first importance. Buckwheat, in some sections, is also a main source of surplus. In spring, the willows and maples, followed by dandelion and fruit bloom, furnish both nectar and pollen for early brood rearing. In the mountains, azalea and laurel furnish some

Fig. 107. Blossoms of Clethra, or sweet pepper bush.

honey. Black locust, tulip-poplar and sumac are valuable in certain localities. Basswood, goldenrod and asters should also be included as of local importance.

**PENNYROYAL, see Wild Pennyroyal.**

**PEONY.**

The cultivated peonies are introduced from Asia and are commonly grown for ornament. Most varieties are double and produce no pollen. The single varieties, however, produce pollen in abundance, and at times the bees seek them eagerly. The writer has seen as many as six to eight bees gathering pollen on a single blossom. The opening buds also seem to exude a nectar-like substance sought by ants and bees.

**PEPPERBUSH or WHITE ALDER (Clethra alnifolia).**

The sweet pepperbush occurs from Maine along the coast to Florida and west to Louisiana. It is a small shrub with white flowers, as shown in Figure 107, which appear in midsummer. In Alabama, Georgia and north Florida, it is common in the coast plain, on swampy banks of streams and in low, wet thickets. It is very fragrant when in bloom and is often used for ornamental planting on lawns and in parks. The honey is thick, white and of fine flavor. In localities where the plant occurs abundantly, in the wild state, it seldom fails to bloom, since it grows in wet places and is unaffected by drought.

Fig. 108. Blossoms and fruits of pepper tree.

**PEPPERIDGE, see Tupelo.**

**PEPPER-TREE (Schinus molle).**

The pepper-tree, a native of western South America, has been widely planted in California for ornament and shade. Its bright red berries are a substitute for pepper, hence the name. It is a well-known tree on the Pacific coast, as far north as Martinez, on the Suisun Bay. It is grown in parks, on lawns and along the streets of nearly every Southern California city.

While a small amount of bloom may be seen at almost any time of the year, its principal period is in late summer when there is a scarcity of nectar-secreting blossoms (Fig. 108). The blossoms are rich in nectar and the bees gather some surplus from this source. The honey is amber in color, strong and rather peppery in flavor.

The flowers are small and of a greenish or yellowish color, in large sprays. The berries ripen in November and December.

**PEPPER-VINE, see Snowvine.**
**PERSICARIA, see Heartsease.**

**PERSIMMON (Diospyros).**

The persimmon, or possom-wood **(Diospyros virginiana),** grows from southern New England south and west to Missouri, Arkansas, Florida and along the gulf to Texas. It is a tree of medium size, reaching a height of 50 feet and rarely exceeding 12 inches in diameter. (Fig. 109). The fruit is composed of a rich and palatable pulp and a few large seeds. When green it is very astringent and very disagreeable. The flowers appear in May in the southern part of its range, and later northward. Where abundant, persimmon is a valuable source of nectar. The Mexican persimmon **Diospyros Texana),** called also date plum, is a shrub or tree 10 to 30 feet in height. It thrives best in canyons and ravines, and is common over much of south Texas. It is frequently reported as an important source of early nectar in many parts of Texas.

Franklin Sherman, Jr., lists the persimmon as sixth in importance of the honey sources of North Carolina. He states that it is irregular in yield and lasts but a short time, but does well while it lasts.

**PHACELIA (Phacelia).**

Jepson described thirteen species of phacelia as native to California. Of these Richter lists four as of value to the beekeeper. Hill vervenia **(Phacelia distans)** he lists as common in the plains and foothills, yielding both nectar and pollen. The caterpillar phacelia **(Phacelia hispida)** is listed as common in the chaparral belt, yielding a water-white honey of fine flavor that candies soon after extracting. This is common in Ventura County, and M. H. Mendleson reports that he extracted a carload of honey from this source before the blooming of the sages. **Phacelia ramosissima** is reported as a fair honey plant, but not equal to the others. The valley vervenia, or fiddle neck **(Phacelia tanacetifolia)** is listed by Jepson

Fig. 109. Swarm of bees building comb in a persimmon tree.

("Flora of Western Middle California") as found in the Sacramento Valley and southward to southern California. It blooms in April and furnishes bee pasture in about six weeks from seed, and the bloom lasts about six weeks.

> "The nectar flows all day. The honey is amber in color, sometimes light green and of a mild aromatic flavor. Cows fed on it show a marked increase in flow of milk, but will not eat it alone at first."—Harry E. Horne, page 342 of above book.

This species was introduced into Germany and had quite a boom there in the early nineties. Much attention was given it in the German bee magazines and it was endorsed as valuable both for forage and for bee pasturage.

Scholl lists **Phacelia congesta** and **Phacelia glabra** as yielding sparingly in Texas. Thos. Wm. Cowan writes as follows, in American Bee Journal, in regard to the growing of phacelia in Europe:

> "The one grown in Europe, **Phacelia tanacetifolia,** is literally covered with bees from morning till night. The species was introduced into Europe from California in 1832, and is called tanacetifolia (tansy-leaved) from the resemblance of its leaves to those of tansy. It is an annual with bluish pink flowers, racemes spike-formed, elongated, corymbose; height of plant two feet. It is grown in Europe as a bee plant for its nectar, and is the only one which produces an appreciable quantity of it."—November 20, 1902, page 751.

A beekeeper from Indiana reports that **Phacelia purshii** grows freely in the wheat fields in his locality and that the bees work freely on the blue flowers. He states that in places it grows so abundantly that the wheat takes second place to the phacelia. On the 27th of May, 1919, strong colonies already had full depth extracting supers almost filled. The honey from this source is of good quality.

## PHYSIOLOGY OF NECTAR SECRETION.

What we call individual plants are complex communities of real microscopic individuals, which biologists call cells. These are associated in numerous sub-communities differing from one another in structure and function. Their specialization results in a division of labor and a correspondingly large total efficiency, much as specialization and division of labor lead to efficiency and productive possibilities in a nation consisting of states, and these of smaller communities made up of trades, guilds and professions, which in co-operation follow the manifold activities that characterize a nation and collectively constitute the national life of its individuals, which is far more effective and greater than the individual life of any one person or class.

The active, living part of a cell is its protoplasm—the physical basis of life, as Huxley called it in animals and plants alike. Commonly this protoplasm encloses itself by a wall of cellulose, an organic substance manufactured by the protoplasm. Where two cells are in contact, they are usually flattened against one another. When men first began to use the microscope, only a little over two centuries ago, it was the walls and shapes of cells that attracted attention, and the resemblance to honeycomb on a small scale was so striking that the cavities were naturally called cells.

Protoplasm itself is a very complex substance, chemically, and even the much simpler cell-wall is far from being always really one identical

substance. A considerable part of the thickening of matured cell-walls has been laid down on the original partition between two cells, and not only differs from this but is not alike in different kinds of cells, and in structures like wood and cork it is impregnated with other materials that affect the cell-wall very greatly in such respects as hardness and permeability to water.

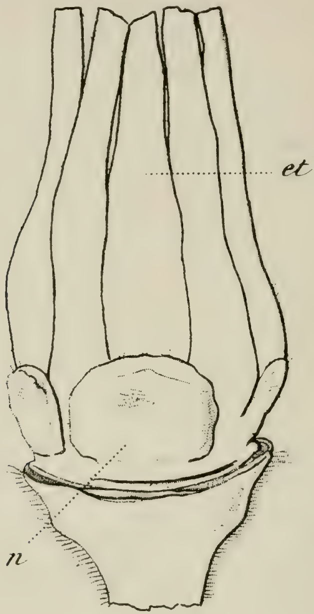
The shells of nuts, for instance, are so impervious that they are commonly "stratified" by planters so that their hard shells may disintegrate more or less as a preliminary to germination, a process that not infrequently requires more than a year unless hastened by some expedient like that of passing haw fruits through the digestive mill of poultry as a means of softening their boney cores, of filing the hard envelope, which is a favorite trick of gardeners with nut-like fruits of the lotus or with canna seeds. (This is similar to the scarifying of sweet clover seed.—Editor.) This is the reason that several times as much clover seed—even good seed—must be used on an acre as seems necessary for securing the desired number of plants. One of these modifications is usual in the outer layers of cell-walls on the surface, and it is called cuticularization. Cuticularized walls are more or less completely water-proofed. When the cells that produce nectar are at the surface, their outer walls are cuticularized in this way; when they are within the nectary and the nectar passes out through stomata, this is scarcely, if at all, the case.

The greater part of nectar is water, which reaches the surface from within the plant cells. To do this it must pass through walls that are little, if at all, cuticularized, or it must break through the cuticle. This does not mean that it must break through the entire cell-wall; a small part if this is modified by the protoplasm into a gum or mucilage, or some similar substance, and the water accumulates in this layer and swells it until the overlying cuticle is burst. Some form of sugar is a frequent result of this disintegration of cellulose. Dissolved sugars pass through the ordinary cellulose wall, but they do not pass through the ordinary surface layer of protoplasm in the outer cells.

When water is separated from a solution like that of sugar by a filter of this sort, which allows water to pass but is not permeable to the dissolved substance, the action is set up that physicists call osmosis, and water accumulates on the side of the dissolved substance until it exercises a very considerable pressure. This action not only bursts the cuticle, when it starts beneath it, but results in a flow of water within the plant at that point.

The absorbing roots of plants show another result of this physical property, osmosis. They are not waterproofed; water is continuous through them, from the thin layer in which it occurs about particles of the soil, to the water which composes a great part of the weight of the protoplasm within the cells. This sap of the root cells contains dissolved sugar and other osmotic substances. Osmotic absorption by the roots results in a pressure of several atmospheres. This pressure, passed from cell to cell, gives the crispness to fresh celery. Its loss, through evaporation from the leaves, results in the loss of this crispness, or wilting.

When evaporation is slight, as in a saturated atmosphere, water exudes at the surface through pores such as occurs at the tip of a young grass or clover leaf. Water pores of this sort are common. They are regarded as pressure-valves by many botanists. The water that they eliminate is usually filtered by the protoplasm that it passes through, which does not allow the passage of substances dissolved in the cell sap; but some plants which grow where they absorb very "hard" water pass lime salts out through their water pores to such an extent that they are encrusted with lime as the water evaporates.



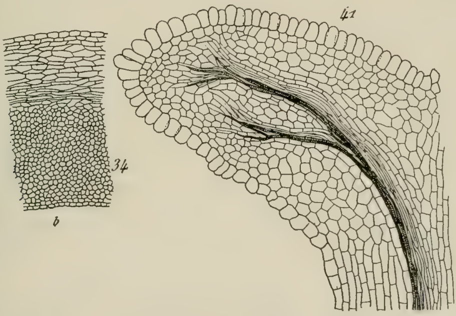

Part of flower of *Geranium pyrenaicum.* (*n*) nectaries; (*et*) stamens. Greatly magnified. Copied from Bonnier's "Les Nectaires."

The safety-valve elimination of water under strong internal pressure and lessened normal evaporation is hardly to be called excretion or accretion; the extruded water is neither by-product nor manufactured output. The elimination of lime appears to be on the border line of excretion.

Nectar is not merely water; if it were its production would be more easily understood. To the taste, it is sweet; to the sense of smell, it is

often fragrant; occasionally it is poisonous; often it is somewhat colored. Commonly it is very fluid, but in the nectar-cups of poinsettia it becomes very gummy. These properties come from substances—sugars, volatile oils, poisonous organic compounds—that were made by and in the plant, and they differ in different kinds of plants. Whatever bees or ants may do in changing nectar into honey, they do not entirely change or remove these substances, and the rank brown honey of the drug store is as easily run to its source as the popular white clover honey, the daintily flavored product of western alfalfa, the aromatic acid honey of the red raspberry, or the greenish product of the sweet clover with its delicate vanilla-like aroma, the cumarin source of which shows itself in an occasional headache, much as the minor organic constituents of some honeys derived from the heath family now and then prove seriously poisonous.

A fluid that contains these organic substances necessarily falls into the category of excretions or secretions, according as it represents waste or usable material. As either excretion or secretion it is the product of specialized organs, glands, and its appearance marks these glands as in action or performing their function. Whatever else may be involved, this depends upon the activity of their protoplasm, or is controlled by it. When this is killed, secretion or excretion stops.




All parts of plants are composed of individual cells flattened against one another. This figure copied from Bonnier's "Les Nectaires," exhibits a longitudinal section of a stamen in *Colinsia bicolor*. Magnified.
At left (34) cross section of filament.

One result of the protean character of protoplasm is its different behavior in different plants, different organs of the same plant or different phases of the activity of an individual cell. In either case it can perform its functions only between certain limits of environment ,and it performs them best somewhere between these limits. For each function and each condition there is what physiologists call a minimum—below which it is not carried on, a maximum—above which it has stopped, and an optimum—or most favorable. Just as in the efficient working of a human factory, power and raw materials are necessary, and workmen must be onto the job, however favorable the other conditions of manufacture may be.

The secretion of nectar and the storing of honey are consequently not quite comparable, for the activities of the honey plant are concerned with the first, and the activities of the bee are concerned with the second, though these are largely influenced by what the plant is or is not doing. This must be remembered always when comparing such records of honey-storing as Mr. Strong's careful hive-weighings through a generation, with Mr. Kenoyer's quantitative measurements of nectar secretion.

Nevertheless, the most favoring conditions of nectar secretion and honey storing agree in a number of respects. Vigorous early development of the plant puts it in condition to do its share of the work best; whatever conditions may prevail during what for most plants is a very short part of the growing season, when it is in bloom. Vigorous early development of the hive bears the same kind of relation to the final result. Early honey must be stored before the bees have reached the full strength of the season, which may have something to do with the fact that the bulk of the harvest is gleaned from plants that flower later or continue to flower for a relatively long time.

Mr. Strong's observations in Iowa show that over half of the net increase in honey storage in southern Iowa is made in June, and over four-fifths in June and July. These are the months when the most productive nectar plants flower, and the hives have reached the crest of their speculative activity and are undergoing division by that time.

Physiological studies show that the afternoon temperature for nectar secretion is high—between 90 and 100 degrees Fahrenheit. Observation on the hive shows that its workers are at their active best in moderately hot weather. Mr. Strong's twenty-nine-year average shows that over half of the average honey for the year is stored when the daily maximum is between 80 and 90 degrees, and nine-tenths of it is stored when the high temperature of the day is between 80 and 90 degrees. Nectar is most abundantly secreted, other conditions being equal, in warm days following cool nights; bees do not seem usually to work more actively on such days, though a record day for heather honey in England began with a frost. Damp air increases the quantity of nectar, as of the expulsion of water through water pores; but dull, rainy weather lessens or stops the activity of the bees.

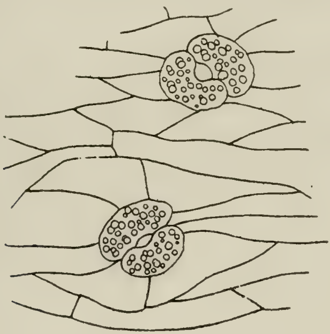
Nuptial nectar is secreted chiefly before or during the period of sexual maturity of the flowers. Many, like cotton, golden currant and horse-chestnut, change color as this period of sexual functioning and maximum nectar secretion passes, and bees often are quick to catch the signal. Extra-nuptial nectar is secreted in greatest quantity while the near-by flowers and foliage of the plant are young.

Nectar differs from time to time in quality as well as in quantity. In damp weather the increased quantity commonly causes a greater dilution of its content of sugar, and the bees have been shown to store a greater weight of honey several days after a rainy day than immediately following it. Though the greater part of nectar is water, its essential part, for the bee-man, is sugar, chiefly a mixture of two kinds of sugar, that possess a different molecular arrangement though containing the same number of

carbon, hydrogen and starch atoms, which causes them to behave differently when examined by polarized light, and materially affects other of their physical properties.

The flow of the water of nectar seems to be like that of water through water pores, an infiltration under pressure when root-absorption is least active and leaf evaporation checked; but thoroughly and repeatedly washing the glands sometimes puts a stop to it. Beating rain does this as effectively as experimental washing. Change of position and closing in dark, rainy weather characterize some flowers, and keep the rain from washing away their accumulated nectar and checking its replenishment. This was Sprengel's explanation of the fringe of hair on the petals of the wild geranium. In proportion as such nectar guards are effective, they preserve the supply and contribute to its continuance, in proportion as rain has opportunity to beat upon the nectar glands it wastes and may even check the production of nectar.

This stopping of nectar flow by washing away the secretion of the glands, is connected with the affinity for water of sugars. The flow of water appears to be started by the osmotic force of the disintegrated part of the walls of the secreting cells; it is stopped when the resulting substance has been removed from the outer surface of the secreting cells.



Stomata on nectariferous tissue of *Xanthoceras sorbifolio*. Greatly magnified. Copied from Bonnier's "Les Nectaires."

If this were all, unless the degenerating cellulose were replenished in sufficient quantity there would hardly be such a thing as honey production. Indeed, some extra-nuptial glands secrete a nectar containing so little sugar that even ants may not be attracted by it—as is said to be the case with climbing smartweeds cultivated in England, though it is not usually true of such plants growing wild here, where they are at home. Commonly, however, the sugar in nectar is replenished while the secretion of fluid continues.

The passage out of sugar from a living cell is very different from the

escape of water; the latter may result from pressure on the one hand or osmotic draft on the other, because the outer protoplasm is permeable to water but not to sugar. When sugar is secreted, this protoplasmic layer becomes to a greater or less degree permeable to the escaping sugar. This is one phase of the activity of the living protoplasm, for secretion is a vital phenomenon. What greater or less permeability of protoplasm actually consists in is a matter of theory rather than observation, but the phenomenon is a subject of observation and experiment. Alternating warmth and cold, within limits, affect it; it has its optimum, at a rather high temperature, as well as its minimum and maximum. Through an adequately permeable membrane, the flow of either water or sugar may be outwards—as it is in normal secretion, or inwards—when the secretion is absorbed—as experiments show to be true under some conditions.

Water for nectar secretion is obtained in the first place through the roots of the plant and travels from the point of absorption to the point of secretion. Sugar for nectar secretion is manufactured within the plant, very close to the point where it is secreted. It is primarily a product of the carbon-fixing or photo-synthetic activity that marks green plants as the food-makers of the world. Sugars appear to be among the earliest-formed of such carbon-containing or organic substances in the plant; but usually they are changed into starch for storage, and this is subsequently digested or transformed into a soluble sugar when the time of its use comes. The cells about some nectar glands are storage repositories of sugar; in other cases they accumulate a reserve of starch, as raw material, before their activities begin in supplying sugar.

Evidently, back of the nectar-production of a given day or season, very closely related to its own optimum conditions of temperature and humidity, lies the earlier vegetation of the nectar-producing plants. Strength and vigor of growth, a good reserve of stored food from the year before, or favorable spring season, these would seem logically to affect the activity of the plant in performing this as well as others of its functions. Kenoyer's conclusions, from Strong's honey-gathering statistics, give support to this expectation: "There is an evident alteration between good and poor years," as in apple production; "a good year has a rainfall slightly above the average, preceded by an autumn, winter and spring with more than the average precipitation," affording adequate and lasting soil moisture; "a rainy May scarcely fails to precede a good honey season," for the same reason, "a cold winter has no detrimental effect on the yield of the succeeding season, but a cold March reduces it," through preventing a fair early growth of the honey plants; "a winter of heavy snowfall, in the great majority of cases, is followed by a larger honey yield," because of its contribution to the soil moisture and the protection afforded the plants during their hibernation.

Of these conclusions, most bear directly on the conditions favorable for nectar secretion by the plants; some bear as directly on those favorable for the wintering in prime condition of the bees. Honey production rests upon both, not only in June and July and on individual days in those

months of greatest honey storage, but on preceding days and months of preparation. Perhaps the suggestion may be made, even that it goes much further back, through long centuries of selective evolution, side by side, of nectar-yielding plants and honey-storing insects, gradually coming into mutually helpful harmony.—William Trelease, University of Illinois. American Bee Journal, January, 1920.

Fig. 110. Filaree or pin clover.

**PIGEON BERRY, see Buckthorn.**
**PIGEON CHERRY, see Wild Cherry.**

### PIN CLOVER or FILAREE (Erodium cicutarium).

The pin clover, or alfilaria, or filaree, is widely distributed in the Old World, and in this country has been naturalized from Europe. It is especially well known on the Pacific Coast from British Columbia to southern California. There it is said to be one of the most valuable wild pasture plants.

It is also called pin grass and heron's bill. It has a long period of bloom, beginning in February or March in California, and in some places continuing through the summer. It produces an abundance of pollen and considerable honey of good quality. In Gray's botany it is listed as "storksbill," and is mentioned as scarce in New York and Pennsylvania. It is recorded as occurring in Alabama, where it apparently was carried with railroad ballast. June is given as the blooming period in the vicinity of Mobile.

It is also known in several places in Connecticut, where it is said to bloom in May and June. Professor Pammel states that it is abundant in the dry soils in the Salt Lake basin and from Colorado to Texas. The seeds cling to the wool of sheep and this aids in its wide distribution.

Figure 110 shows the plant with blossom and seed pod. It is from the peculiar shape of the latter that it gets the name of "storksbill" and "heron's bill."

### PINE (Pinus).

Occasionally honeydew is reported from the pine trees. The following references are typical of those to be found in current literature:

> "We are having a real flow of water-white honeydew from the pine here in Polk County. It has been on now for two weeks. Bees in general are in bad condition."—Luther Presswood, Reliance, Tenn., Jan. 18, 1907. American Bee Journal, page 98, 1907.
>
> "Large quantities of honey are often secured from pine woods in certain parts of Germany. The honey is nearly black in color, still it finds many admirers, and must, therefore, be of better quality than the honeydew gathered here at times. The Emmendingen Beekeepers' Society furnishes all the honey for the Grand Duke's table (in Karlsruhe), and it is specified that the honey must be this black honey of the pine woods."—Bztg. for Schlesw.—Holstein. American Bee Journal, page 616, 1906.

Similar honeydew is harvested in Switzerland and appears to be also much prized by the consumers.

### PLUM (Prunus).

Plums, both wild and cultivated, are important sources of nectar over most of the United States. There are twenty or more species which are native to North America and which are generally known as wild plums. The blooming period comes early and with other tree fruits they are of great value as the source of nectar and pollen at a season when the colo-

nies most need stimulation. The nectar yield is sufficiently abundant for the bees to store surplus where colonies are strong and weather conditions favorable. In Sacramento County, California, surplus is sometimes reported from prunes. There are probably few places where bees are kept in America where plums of some variety are not present.

Fig. 111. Plum blossoms.

**POINSETTIA (Euphorbia pulcherrima).** The poinsettia is a well-known ornamental plant. It is a shrub, native to tropical America, grown to a considerable extent for ornamental purposes in California. The blossoms are small and inconspicuous, but there is a striking cluster of brilliant red leaves, surrounding the flowers, which give an impression of flowers.

The nectaries are very conspicuous cups at the side of the blossoms. Nectar is secreted in abundance, and if the plant was sufficiently common it would be an important source. The nectar gathers in large drops.

**POISON IVY, see Laurel; also Sumac.**
**POISON OAK, see Sumac.**

**POISONOUS HONEY.**

Much has been written in regard to poisonous honey. Well authenti-

cated cases of serious poisoning from honey are rare, so rare, indeed, that many persons doubt whether such cases occur. There are persons with a peculiar susceptibility to honey from any source. To such, honey may seem to be poisonous, which can be eaten by others without any ill effect. Prof. A. J. Cook, writing in the American Bee Journal (October 12, 1905, page 711), mentioned having on several occasions received samples of so-called poisonous honey, which he ate without inconvenience.

In December, 1880, issue of American Bee Journal, page 552, a case is mentioned where a native of New Zealand died from eating honey gathered from the wharangi bush **(Melicope ternata),** which is said to be one of the two poisonous plants to be found in New Zealand. The symptoms are reported similar to strychnine poisoning. A letter from New Zealand published in Gleanings, page 435, 1908, reads as follows:

> "Some one, usually a native, gets poisoned every year about here through eating bush honey, usually not capped, and puka-puka usually gets the blame. Mr. Hopkins had a look at a case of Moaris honey poisoning last year, and I think puka-puka got the blame; but the fact is significant, nevertheless, that it is the Maoris only, or principally they, that get poisoned, and in that case the honey eaten is never capped."—Stephen Anthony, Wastete, New Zealand.

The mountain laurel **(Kalmia latifolia)** is the plant most frequently reported as yielding poisonous honey. This shrub is common to the mountain regions of the Eastern States, and it would seem that cases of poisoning would be reported much more frequently if there was good reason to suspect the honey from this source. It is a well-known fact that disagreeable odors disappear from honey that is well ripened. In this connection a writer in American Bee Journal, page 664, 1884, suggests that there is no evidence of poisoning from well ripened honey. He further states that uncapped honey from the yellow jasmine is actually poisonous and has produced death, but that after it is capped there is no honey more wholesome. It should be noted that special emphasis was placed on the fact that the cases of poisoning in New Zealand were from eating uncapped honey.

Pammel states (Manual of Poisonous Plants) that honey obtained from **Euphorbia marginata,** the well-known snow-on-the-mountain, is poisonous and unfit for use. He also states that the Indians of Brazil use honey gathered by wasps from flowers of **Serjonia lethalis** for poisoning their arrows, and also as a fish poison. It contains a narcotic poison which causes death.

The following resume of the subject is copied entire from Pammel:

> "Prof. Lyman F. Kebler, who has made a somewhat extended investigation with poisonous honey has given an excellent bibliography with reference to the early literature on the subject. It has been known for centuries that the honey collected from **Ericaceae** acts as a narcotic irritant, producing giddiness, vomiting and purging. Poisonous honey was described by Xenophon. He gives a fairly accurate description of how the soldiers of his army acted that ate honey that was poisoned. He states that they lost their senses, vomited and were affected with purging, and those who had eaten but little were in-

toxicated, but when they had eaten much they were like mad men. Strabo and Pliny spoke of poisonous honey, the latter writer, an early naturalist noted for his accurate observations, records poisonous honey, which he called "aegolethron" (goat's death), which bees collected at Heraclea. He gives a description of the honey, which is said to have had a peculiar smell and produced sneezing. It is generally supposed that this honey came from a species of **Rhododendron,** the **R. pontica.** This and allied species are the chief source of poisonous honey in Asia and Asia Minor, but it may be said in this connection that honey collected from the heather in Scotland is not poisonous.

"Barton, an early American botanist, reported poisonous honey in New Jersey as early as 1794. Subsequently Coleman reported a large number of cases in 1852, and Gammer, in Gleanings in Bee Culture, and several writers in the American Bee Journal, reported poisonous honey. Other writers, like Chestnut and Crawford, have reported on the occurrence of poisonous honey in the United States, and Kebler reports no less than eight cases for New Jersey in 1896, and believes that it is much more common than the records seem to indicate. Kebler was fortunate enough to investigate some of the poisonous honey following a case of poisoning in New Jersey. He examined a part of the comb of the dark honey which had a light brown color and a nauseating odor, pungent taste, caused a burning sensation in the back of the mouth similar to that of aconite. Persons who partook of a small amount of this honey began to cough immediately. He also made a chemical analysis of the non-suspicious honey, digesting with alcohol, then evaporated, the residue was again treated to alcohol and evaporated and administered to two cats. One received a small dose and the other a large one. The results from the cats were so interesting that I quote from Professor Kebler:

" 'The small dose produced partial exhaustion, relaxation of the voluntary muscles and general depression. The large dose in a short time produced restlessness, vomiting, purging, prostration and almost complete loss of the voluntary muscles, showing that the honey contained a prompt and potent poison. The animal could scarcely be induced to move, and when motion was attempted, first the fore-limbs would fail, and then the back-limbs would give way. First one portion of the body would sway in one direction, then the other portion in another ,reminding one of a highly intoxicated person. Had the entire dose been retained, death undoubtedly would have followed. As it was, the cat had regained her normal condition only at the end of twenty-four hours.' "

Along with this we may append the symptoms as reported by the physician who attended the persons who were poisoned:

"Mr. and Mrs. Chambers took but a small quantity, yet each noticed a peculiar, pungent, burning taste in the comb as soon as it had passed their lips. In fifteen or twenty minutes afterwards Mrs. C. was taken with nausea, abdominal pain and vomiting, soon followed by loss of consciousness, coldness of extremities, feebly acting heart, and complete collapse. While ministering to her, Mr. Chambers, who had also experienced the initiatory symptoms of pain and nausea, suddenly exclaimed, 'I cannot see,' and soon sank in a state of syncope to the floor. In each case the symptoms were similar. Retching, vomiting, purging, acute gastric and abdominal pain, and continued cramps for some hours, with surface coldness, and deadly pallor, and the general symptoms of collapse.

"Kebler was, however, unable to definitely locate the andromedotoxin found by Plugge. This author recorded it for a large number of

plants as follows **Andromeda japonica, A. polifolia, A. Catesbaei, A. calyculata, Kalmia latifolia, Monotropa uniflora, Pieris formosa, P. ovalifolia, Rhododendron grande, R. barbatum,** and **R. fulgens.** It has been recorded for additional plants by Greshoff, who mentions the following plants which produce poisonous honey: **Nerium Oleander, Cytisus Laburnum, Pieris ovalifolia, Callotropis procera, Daphne, Pontica, Buxus balearica, Clerodendron serratum, C. Bhramaramari, Sapindus emarginatus.** (It is said that thousands of bees are killed by this honey.) **Centaurea scabiosa, Carduus natans, Scabiosa succisa,** A South African species of **Euphorbia** also produces a poisonous honey which was not noted by Greshoff.

**POISONWOOD (Metopium metopium).**

The poisonwood is a tree found in southern Florida, the West Indies and Central America. It is known by a variety of names, bum-wood, hog-gum, coral sumac or doctor-gum. Its sap is dangerously poisonous, and some persons are affected by a near approach to the tree. The tree reaches a height of more than forty feet and in south Florida it is the source of large quantities of surplus honey of good quality. The honey is usually blended with that of other sources blooming during the same period.

The tree has a thin bark which splits into large scales as it grows older, These are of a reddish brown color, brighter on the inside. It is sometimes confused with manchineel and is often classified as a **Rhus.**

**POLLEN.**

Pollen represents the male element of reproduction in seed plants. The flowering plants are normally reproduced by seed. Fertilization is brought about by the intervention of the grains of pollen which are borne by the stamens or male organs. In the corn plant the stamens are produced in the tassels where pollen is developed in great abundance. The pistils, or female organs, are represented by the silks attached to the ear. There is a separate silk attached to each kernel, and each must be separately fertilized. In many plants both stamens and pistils occur in the same blossom, as is the case with apples, pears, etc. In some cases the stamens or male organs are borne on a separate plant or tree, as is the case with the persimmon. Cucumbers have the separate organs in separate flowers. In order to insure fertilization it is necessary that the pollen grains be carried from the stamens to the pistils. In the grasses and similar plants this is usually acomplished by the wind, while in most fruits, insects are the principal agents.

Pollen grains are very minute and are produced in small sacs in the tip of the stamen, commonly called anther. When ripe, the breaking of the sac sets the grains free in great abundance. A single grain is sufficient to fertilize an ovule and produce a seed; yet, because of the distance between the stamens and pistils, large quantities of the pollen or flower dust are necessary to insure pollination. Ragweed and corn produce pollen in such abundance that one brushing by the plants is dusted so freely as to appear to be covered with flour.

Pollen is of special importance to the beekeeper, since it serves as food for young bees. It is the sole source of nitrogenous food for the growing

larvæ, and is stored in large quantity in the open cells of the brood combs. Without an abundance of pollen available for food for the developing brood, the colony cannot prosper. Pollen is second only in importance to surplus honey to the beekeeper, and an abundant supply of plants which yield pollen during the brood-rearing season is very desirable.

**POLLINATION.**

Pollination is the fertilization of the blossom of a plant, resulting in the development of seed. As ordinarily used among the beekeepers, pollination refers to the transfer of the pollen grains from the stamens of one plant to the pistils of another. Since many plants are self-sterile, it is necessary that pollen from other plants and sometimes from other varieties be brought to them to insure fruitage. As already stated under "Pollen," the honeybee is the principal agent in the pollination of many of the edible fruits.

So important is the bee regarded by horticulturists that cucumber growers contract for colonies of bees to be placed in their greenhouses, cherry growers often lease apiaries to be moved to their orchards at the beginning of the blooming period, and apple orchardists contract with beekeepers to furnish sufficient bees to insure fertilization of their orchards.

Darwin was among the first to realize the importance of cross pollination. He showed that continued self-fertilization resulted in inferior fruit, while cross fertilization increased the vigor of the offspring. Beach has shown that many varieties of grapes are self-sterile, and at the California

Fig. 112. The California poppy is a gorgeous flower.

experiment station it was shown that "bees are a necessary aid in pollination with the French and Imperial varieties of prunes." It was proven that practically no fruit was produced when all pollen-carrying insects were kept from visiting the blossoms. (Bulletin 291, California Experiment Station).

It has been shown by numerous experiments that many varieties of fruits, especially of apples and pears, are likely to be unfruitful if deprived of the services of the honeybee as pollen carriers.

**POPLAR, see Tulip-Poplar, also Aspen.**

**POPPY (Papaver).**

The garden poppy **(Papaver somniferum)** is a native of Asia, but is widely cultivated in many countries, including our own. It is the source of opium and morphine, drugs widely used in the practice of medicine. The bright-colored flowers are very attractive to the bees, which seek them in large numbers and fairly revel in the abundant pollen masses. The pollen secured from poppy blossoms is very dark. It is probable that the plant furnishes some nectar, also, and there are numerous reports to the effect that the bees show evidence of a narcotic when working on this plant.

The California poppy **(Eschscholtzia californica** (Fig. 112) is a common and widely diffused plant in California. It is a gorgeous plant of variable habit, especially abundant in spring, but in some parts of the State may be found in flower at almost any season. Richter lists it as the source of some honey and of large amounts of orange-colored pollen.

The prickly poppy **(Argemone),** often called poppy thistle, is widely distributed, especially in the southwest. It is the source of large quantities of pollen.

**POPPY THISTLE, see Poppy.**
**POSSUM HAW, see Holly.**
**POSSUM-WOOD, see Persimmon.**

**PRAIRIE CLOVER (Petalostemon).**

There are several species of prairie clover native to the western prairies from Indiana west to the Rocky Mountains and south to Texas. There are frequent reports to the effect that they are valuable honey plants, though no longer sufficiently plentiful to be important except in a few localities.

**PRICKLY ASH (Xanthoxylum Clava-Herculis). TOOTHACHE-TREE.**

The prickly ash or toothache-tree is found from North Carolina to Florida and west to Texas. It is a small tree with the bark armed with short, warty thorns, while the branches have longer ones.

In east Texas it is frequently mentioned as a source of honey. The honey is reported as pungent in taste, sharp and peppery and light in color. The blossoms yield freely, and, where sufficiently abundant, may be expected to yield surplus. At Palestine, Texas, surplus is reported from prickly ash. (See also Colima).

**PRICKLY PEAR or INDIAN FIG (Opuntia).**

Plants of the cactus family are widely scattered in the arid regions from Dakota to Washington and south to Texas and California. Figs. 114 and 115.) Of the prickly pears **(Opuntia)** there are about 150 species, mostly found in the warmer sections of North America and southward. A few are to be found in sandy soils further east, ranging from Ontario and Massachusetts south to Florida. They are also sometimes grown as ornamentals. The blossom of the prickly-pear is of pale yellow color and very attractive. (Fig. 113.) It is reported as a source of nectar in both

Fig. 113. Blossom of the cactus or prickly pear.

Texas and California. **Opuntia engelmanni** is reported by Scholl in "Honey Plants of Texas," as "of much importance to the beekeeper, especially during a season of partial drought. Both an abundance of pollen and honey was obtained, the honey being light amber in color, of heavy body but 'stringy,' so much so that it fairly draws out into strings when very thick. The flavor is very rank."

In some parts of the Southwest it is valued more for pollen than for nectar. Beginning in July, it blooms for four to six weeks. E. G. LeStourgeon reports that in the vicinity of San Antonio, Texas, it yields surplus honey about one year in four, but that the flow is usually short, seldom more than four or five days. A peculiarity of this honey is that of granulating in large crystals in clear liquid. It is often spoken of as "buttermilk honey," because of this peculiarity. LeStourgeon secured an average

yield of 87 pounds per colony of cactus honey in Atascosta County. Such yields from this source are rare. Cactus grows in great abundance over large areas of Texas and is probably of more importance to beekeepers in that State than in any other.

Fig. 114. In parts of Texas the land is covered with cactus as far as the eye can see.

**PRICKLY POPPY, see Poppy.**

**PRINCE EDWARD ISLAND—Honey Sources of.**

Alsike and white clover are the principal honey plants of the Island, with **Tilia europea** also important at Charlottetown.—F. W. L. Sladen.

**PROPOLIS.**

Propolis is a resinous gum gathered by the bees from buds of trees, and used to close crevices about the hive. It becomes brittle and hard in cold weather, but when warm is sticky and very tenacious. The beekeeper finds it quite a problem to keep his hands free from propolis when manipulating the hives in mid-summer. Some races of bees deposit propolis much more freely than others, the Caucasians being especially inclined to gather a great surplus of the cement and place it in lumps about the hive. If, perchance, a mouse, beetle or other object enters the hive which the bees are unable to remove, they frequently coat it freely with propolis, and there it remains.

Cracks seem obnoxious to the bees, and the small spaces between the frames are quite likely to be filled with the cement. In the production of

comb honey, the tendency of the bees to fill every crevice with it leads to much labor on the part of the beekeeper in cleaning his finished sections for market. This is especially true of honey left on the hive till late in the season, as propolis is gathered in quantity in late fall in anticipation of cold weather.

Cottonwood is thought to be one of the chief sources of propolis wherever that well-known tree is found.

Bees gather much material from a great variety of sources. In addition to the fresh wax gathered from plants and trees, they are often attracted by fresh varnish or other substances from which they can get sticky material to serve as glue.

Fig. 115. A single plant of prickly pear near Brownsville, Texas.

**PRUNE, see Plum.**

**PUMPKIN (Cucurbita pepo).**

The pumpkin is a well-known gourd-like fruit, usually of deep yellow

color, that is widely cultivated as a food for stock and for pie. There are numerous varieties of various sizes and colors. The blossoms are large and showy and very attractive to the bees. The plants yield an abundance of pollen as well as nectar. The honey is amber and not of high quality, and granulates readily.

Where pumpkins are grown on a large scale for stock feed or for canning factories, they are a valuable source of bee pasture.

**PURPLE LOOSESTRIFE (Lythrum).**

There are two species of lythrum frequently reported as honey plants. The European species, **Lythrum Salicaria,** the spiked loosestrife, has become naturalized in wet places from Nova Scotia to Delaware. According to H. D. House, State Botanist of New York, it is common in and around the inlets and backwaters of the Hudson River all up and down that stream. It is also common up the Mohawk Valley, at Oneida Lake and along the railroads westward across the State to Lake Erie. It is a tall plant of vigorous growth, but as it confines itself largely to wet places, it is not likely to be any more of a nuisance than the usual coarse weeds growing in such situations. The bees work this plant freely and occasional reports of honey from this source are received from New York State. The honey is very dark and of strong flavor, having a slight tobacco-like taste as it gets older.

**Lythrum alatum,** a native species, is found from Ontario and Minnesota south to Georgia, Florida and Texas. A report from Oklahoma is to the effect that it blooms with sweet clover, lasting till frost. The bees work upon it from daylight till dark in either wet or dry weather. Similar reports come from Texas. It is found on low lands in the southwest.

It is also reported by beekeepers from New Orleans as attractive to bees in Louisiana.

# Q

**QUEBEC—Honey Sources of.**

In Quebec alsike and white clover furnish the principal surplus honey. In the southern part of the province buckwheat, basswood and sweet clover are also important. Fireweed, blueberry, goldenrod and aster are the source of surplus honey over much of the province and willows and maples are valuable for spring brood rearing.—F. W. L.Sladen.

**QUERCUS, see Oak.**

**QUININE Tree, see Hop-Tree.**

# R

**RABBIT BRUSH (Chrysothamnus nauseosus hypolluca).**

Richter lists rabbit brush as yielding nectar in the vicinity of Independence, California, from September till November. He states that the bees work vigorously on it, but that the honey is dark, of poor flavor and disagreeable odor, and that when the bees are evaporating it it can be smelled all over the place.

There are seventeen different varieties of rabbit brush in the southwestern desert from New Mexico to California and north to Utah and

Fig. 116. Bloom of the tall ragweed.

Colorado. They are described as coarse plants, usually shrubby and growing to a height of as much as six feet. They have small heads of yellow flowers. The Navaho Indians use the heads of the various species to dye wool yellow.—(Flora of New Mexico.)

**RADISH or JOINTED CHARLOCK (Raphanus Raphanistrum).**

The wild radish or jointed charlock is a troublesome weed in the fields of eastern Canada and United States from New England to Pennsylvania. Like many other introduced plants, it has been widely scattered with grain seeds. It has been introduced into northwestern Iowa with oats, where it is spreading in fields and waste places.

Sladen lists it as one of the important sources of nectar in Nova Scotia.

**RAGGED LADY, see Red Gaura.**
**RAGGED SAILOR, see Centaurea.**

**RAGWEED (Ambrosia trifida).**

Figure 116 shows the blossom and leaf of the great ragweed, often called horseweed. This is a very common roadside weed, growing to a height of 10 or 12 feet. It is common in Quebec and Ontario, west to Manitoba. In the United States it occurs from New England west to Colorado and south to the Gulf. It is also found in Cuba and Mexico. It is especially common in the rich lands of the Mississippi Valley from Minnesota to Texas.

The ragweed does not produce nectar, but furnishes large quantities of pollen in late summer and fall.

**RAPE (Brassica napus).**

Rape is a foreign plant related to the cabbage, which has been introduced from Europe. In the United States it is chiefly grown as a catch crop or forage for hogs and sheep and sometimes as a cover crop.

In Europe it is highly regarded as a honey plant, as the following letter from Baron Von Berlepsch, which appeared in American Bee Journal in April, 1874, will show:

> "During the years between 1841 and 1858, that I was a practical agriculturist, I cultivated rape, to a large extent, and can in consequence thereof, and from knowledge otherwise gained, testify most assuredly, that in all Germany there is no plant yielding more honey than rape. I know of instances, occurring in my own experience, where a very populous colony of bees, during time when rape was in blossom, gained a weight of 20 pounds and over in one day.
>
> "On the 10th of May, 1846, there was near me a 65-acre field in blossom. The weather was excellent, and my strongest colony, which I placed on a platform scale, gained that day more than 21 pounds in weight. I know of only one other plant that can be compared with rape as a honey-yielding plant, and that is esparet **(Sainfoin).**

A Wisconsin beekeeper, writing in American Bee Journal the same year stated that rape in Wisconsin is scarcely second to linden. He de-

scribed the honey as of golden color and good flavor. He further cited the fact that rape blooms about the middle of August, when there is little else, as a great advantage in cultivating it for its honey.

The few references to it in our literature indicate that it may be of more value to the beekeeper than is generally recognized.

**RAPHANUS, see Radish.**

**RASPBERRY (Rubus). Also called THIMBLEBERRY.**

The wild raspberry **(Rubus occidentalis)** is a very common plant in the woods of the Northeastern States. Mohr gives its natural range as New England to Quebec and Ontario, Minnesota, Nebraska, Colorado and Oregon, south to Ohio and West Virginia, and along the mountains to Georgia.

Fig. 117. Wild raspberry grows in great abundance in Ontario and other northern regions.

There are several species of wild raspberries, and probably all are good honey producers. Raspberry honey is produced extensively in northern Michigan, where the plant is abundant on cut-over lands. It blooms following the tree fruits and is usually ahead of the white clover. In localities where it is plentiful it is a most valuable honey plant and phenomenal yields have sometimes been reported from this source. A good raspberry location is very desirable. Beekeepers who chance to be near large plantations of raspberries cultivated for market are equally fortunate. The honey is white and of a superior quality. Figure 117 shows a luxuriant growth of wild raspberry as it is found in many localities in Ontario

**RATTAN VINE (Berchemia scandens).**

Rattan vine, or supple-Jack, is a common climbing vine in low thickets throughout the Southern States from Virginia, Kentucky and Missouri, south to Florida and eastern Texas. The flowers are greenish yellow, usually appearing in June. The plant is slender and of vigorous growth, frequently climbing high trees.

In east Texas it is one of the important sources of surplus honey. There the plant is abundant along the streams, and is reported as yielding honey for a long period. The author has found rattan vine highly regarded in many sections of the South, especially in Alabama.

Scholl states that the honey is dark amber in color and used mostly for manufacturing purposes.

**RATTLE BOX or RATTLE WEED, see Loco Weed.**

**RATTLESNAKE-ROOT (Nabalus altissimus).**

Rattlesnake root is listed by the late A. J. Cook as "which swarms with bees all the day long," but the author can find so few references to it that it is probably of little importance.

**RED BAY (Persea Borbonia).**

Red bay, or Florida mahogany, is also known as tisswood, sweet bay and laurel-tree. This tree should not be confused with the magnolia, which is also called sweet bay. (See Magnolia). The alligator pear **(Persea persea)** is a near relative, which has been introduced from Central America and extensively cultivated for its fruit. It has run wild in some parts of Florida.

Red bay is reported as yielding surplus honey in considerable quantity, but of poor quality along the Gulf Coast of Texas. The honey is said to be very dark, suitable for baking purposes. Beekeepers report that the plant is quite dependable, but of limited range.

**RED-BERRY, see Buckthorn.**

**RED BOX-TREE, see Eucalyptus.**

Fig. 118. The blossoms of red-bud appear before the leaves.

**RED-BUD (Cercis canadensis).**

The red-bud, or Judas-tree (Fig. 118) is a common shrub or small tree in the Southeastern States. It is found occasionally from western Pennsylvania to southern Michigan, southern Iowa and Nebraska south to

western Florida and east to Texas. It grows along streams and in the woodlands where the soil is moist and rich. In Alabama it blooms late in February, and in southern Iowa in April. The rose-pink blossoms appearing in early spring, before the leaves are out, make the tree very conspicuous during the blooming period. Where the tree is abundant it furnishes a liberal pasture for the bees for early spring brood rearing. Blooming so early, it is rarely the source of surplus. In the northern part of its range it often blooms with fruit trees and dandelion, so that it is not as important as farther south.

There is another species in south Texas and Mexico which blooms in March, The Texan red-bud **(Cercis reniformis),** and one, the western red-bud **(Cercis occidentalis),** which occurs in the mountains of California and occasionally in Utah.

The red-bud is also known as salad-tree, or June-bud.

### RED CLOVER (Trifolium pratense).

There have been so many conflicting statements regarding the question as to whether or not the honeybee is able to secure honey from red clover **(Trifolium pratense)** that it has seemed worth while to investigate the subject with some care. There have been so many reports of honey from this source, that it is desirable to learn whether the honey did come from red clover, or whether the beekeepers have been mistaken, and some explanation of the confusion is necessary. There is no question but that the plant secretes nectar in abundance, but since the corolla tubes are much longer than the tongues of the bees, they are unable to reach it under ordinary conditions. It is a well-known fact that plants behave very differently under different climatic conditions, so an effort has been made to secure evidence from as many localities as possible, and from a great variety of conditions.

In Iowa the writer has sometimes found bees working freely on red clover in extremely dry seasons. At such times the bees were apparently getting some nectar, although it could not be detected in the hive. However, one year, Mr. C. H. True, of Edgewood, Iowa, had on exhibition at the State Fair, a generous quantity of honey which he thought was secured from red clover. It was slightly tinted with red, and had a flavor different from white or alsike clover honey. The explanation often given is that in dry seasons the florets are somewhat dwarfed, and because of the shorter tube the bee is able to reach the honey. Dr. L. H. Pammel, botanist at the Iowa College of Agriculture, has made a special study of bees and red clover under Iowa conditions. After having many measurements made, he has reached the conclusion that the effect on the length of the corolla tube, as a result of drought, is so slight that the bee would not be able to reach the nectar from this cause. He goes on record as follows:

> "I have for several years closely observed honeybees and red clover, and from these observances I am still inclined to the opinion, earlier expressed, that honeybees do not get nectar from the flowers of the red clover, notwithstanding the opinion of many beekeepers in Iowa." —Third report Iowa State Bee Inspector.

At the 1917 Convention of the Illinois Beekeepers, Mr. Frank Bishop, of Virden, reported that one season he secured an average of 100 pounds per colony from red clover. According to his statement, there was no other bloom within reach at that time. He further stated that he visited the red clover fields, investigated the matter carefully, and was fully satisfied that red clover was the source of the honey.

Fig. 119. Red clover blossoms.

So many reports from well-known beekeepers are to be found in our literature, that it seems worth while to quote several of them, together with the place where the reference is to be found. Mr. Wm. McEvoy, of Woodburn, Ontario, wrote to Gleanings in Bee Culture, page 468, 1907, as follows:

> "In September, 1905, I extracted over 3,000 pounds of pure red clover honey, after giving the bees plenty to winter on. This honey was a light amber color, and good in flavor, and sold for the same price as honey gathered from white clover. My bees being Italians, worked well on the second crop of red clover, which was not injured by the midge in my locality, in 1905, on account of the first crop being cut early."

Adrian Getaz, of Knoxville, Tenn., makes the following contribution to the subject in Gleanings, page 660, 1909:

> "In regard to bees gathering nectar from red clover, several opinions have been advanced. Generally, it is supposed, that, owing to dryer weather, the second crop has blossoms with shorter corollas, and that the bees can reach the nectar on that account. Another theory is that the nectar is more abundant, and fills up the corollas better, and thus comes within reach of the bees. A German apiarist a few years ago undertook to settle the matter, and spent a part of the summer lying down in the clover fields to see how it was. He reported that very few insects take the nectar through the corollas; but some kinds

> cut a hole near the bottom and help themselves through it. The hole once made, a number of insects, including bees, take advantage of it; and if the bees do not work on the first crop, it is because there are few hole-boring insects present."

Here follows a brief report with nothing to indicate whether the bees were seeking nectar or pollen:

> "Last year was very dry and there was scarcely any white clover in blossom here; but the bees went fairly wild on the red clover, and it was the first crop, too."—J. F. Brady, Deerfield, Minn. Gleanings, page 149, 1911.

That the subject is not new will be found by examining the files of the bee magazines of many years ago. Apparently, it has been a controverted subject since beekeeping has been followed seriously in America. In the first volume of the American Bee Journal, page 228, 1861, we find the following:

> "I noticed in August and the beginning of September, while the bees were gathering honey from buckwheat, that they obtained pollen of a brownish color from some source. On investigating the matter, I found that they collected it from red clover. This somewhat surprised me, as I had never seen them gathering honey from the red clover to such an extent, particularly while other forage was plenty. * * * I have also noticed that the bees visited only those heads that were imperfect, the tubes being shorter in consequence."

The principal interest attached to the above is the statement that the bees visited only the imperfect blossoms. On page 9 of the same volume is a statement somewhat similar, reported in one of the German journals, of Italian bees getting honey from red clover, in 1858. It is said that the season was very dry and the blossoms somewhat smaller as a result.

In 1899, page 15, American Bee Journal, we find another report of bees working on it in dry weather:

> "My bees work more or less on it almost every year during hot and dry weather, but it does not produce as fine honey as white clover; when candied it is coarser grained, and has a water-soaked appearance. I wish that my bees would let it alone, for we have plenty of white clover when the red is in bloom.—Fred Bechle, Poweshiek County, Iowa.

Again, on page 27 of the same issue, Theo. Rehorst, of Fond du Lac County, Wisconsin, reports:

> "The mammoth red clover produces good honey and all our honeybees can reach the nectar, although the corolla is far longer and deeper than the common red clover. I never saw any honey from common red clover; only thin, red stuff, thin as water."

In 1903, E. E. Hasty, of Ohio, wrote, in the American Bee Journal, that while he admitted that bees worked on red clover at times, he was extremely doubtful about their ability to get much honey from it. The same doubt has been expressed by numerous observers from time to time, the usual explanation being that the bees are gathering pollen, rather than nectar.

On page 49 of the 1903 volume of the American Bee Journal is reported an interesting case of honeydew from red clover. Since it is the only case of the kind found in all the literature consulted it is quoted quite fully:

"For about ten days my bees have been bringing in honey from the second crop of red clover. Now this is nothing remarkable, for I have seen them doing so for more than twenty years past; but recently, passing through a field of red clover in bloom, I stopped to watch them, and, to my surprise, found them working, not on the blossoms, but on the leaves. This, I confess, I had never seen before. On closer examination I found the clover leaves covered with small plant lice, and the under leaves covered with honeydew, very similar to that frequently found on the leaves of the hickory, oak and other trees, though the honey is not so dark-colored as from leaves of trees."

On page 839 of the American Bee Journal for 1906 is found a rather convincing discussion of the subject of honey from red clover. It was at a convention of the National Association, and several men of wide reputation took part in the discussion, and testified to the fact that they had secured surplus from red clover. Hutchinson stated that he had secured 500 pounds from red clover at a time when there was nothing else in bloom, and that it was a light amber or dark white color. Messrs. Townsend, Stone, Davenport and others agreed that they had secured red clover honey, Townsend reporting as much as 2,000 pounds stored in two weeks' time.

The subject is discussed at length in Bulletin No. 46 of the New Zealand Department of Agriculture, by Isaac Hopkins, whose experience in this connection is interesting. We quote him in part:

"In my early days of beekeeping it was a moot point whether Italian bees worked on red clover or not. At this time I had a unique opportunity of testing the matter thoroughly, an opportunity which would rarely occur; therefore, I feel myself on safe ground when dealing with Italian bees and red clover.

"For five years (1882-87), I was located on the late J. C. Firth's estate at Matamata, where I started large bee farms. My bees, which were chiefly Italians, were near to thousands of acres of red clover. * * * Now and again we saw a few here and there gathering pollen from the blossoms, and sometimes a good deal of pollen from red clover was brought in when, no doubt, it was scarce elsewhere.

"In order to make a thorough test, I shifted, on one occasion, a number of strong two-story colonies to the center of a 700-acre paddock of red clover. The first crop had been cut for hay, and the second crop flowers were just opening. There was no ordinary bee forage anywhere near. After the fourth day, I examined the hives and found from the odor that came from them on removing the covers that some nectar had been gathered from the surrounding clover. I also observed that some clover pollen had been stored.

"There were two seasons out of the five when my bees worked more freely on the red clover than in others. In these seasons it was noticeable that myriads of small-sized moths flitted about the clover, while they were rarely seen at other times. I was much interested, and in casting about for a reason, I became satisfied, after very many tests, that the red clover was secreting at times much more nectar than usual, and it may have been that it reached a higher level in the tubes on these occasions, and so came within reach of the tongues of the bees. Be that as it may, some red clover nectar was gathered from second crop flowers in these seasons."

While the different observers are by no means agreed as to the reason why the bees are able to get nectar from red clover on occasion, the testimony is very closely agreed upon the fact that it is only from the sec-

ond crop, and in hot and dry seasons, that the bees are able to store honey from this source. So many widely-known men come forward with the positive statement that they have been able to secure surplus honey from red clover, that we can hardly question the fact that honey is sometimes stored from this plant. Whether the corollas are punctured by other insects, the tubes are shortened by drought or the nectar rises higher in the tube, remains to be proven.

**RED GAURA (Gaura coccinea).**

The red gaura, also called ragged lady, is common from Montana to Arizona and Texas. It is much sought by the bees for both nectar and pollen. Its nectar secretion is abundant, but it is not sufficiently common to be important. A good stimulant.

**RED GUM, see Eucalyptus.**
**RED-HAW, see Hawthorne.**
**RESEDA ODORATA, see Mignonette.**

**RETAMA (Parkinsonia aculeata).**

Retama is a small tree common throughout southern and western Texas. It has slender branches, bearing the yellow petaled flowers in axillary racemes. It is frequently mentioned as a source of nectar by Texas beekeepers. Scholl states that the bees work on it more or less all summer. Like many Texas shrubs, it has a habit of blooming at irregular periods, from spring till September.

**RHODE ISLAND—Honey Sources of.**

The sources of honey in Rhode Island grouped in the order of their appearance are willows, maples and other less numerous trees, which furnish bees with the early supply of pollen and honey, so useful and so needful in building up the bee population preparatory to the harvest in which the beekeeper shares.

Next come the fruit blossoms, plum, peach, cherry, pear, apple, raspberries, huckleberries and blueberries which, when the spring is favorable, yield good crops of honey. In some places, dandelions are an important addition to the fruit bloom, though not always opening at the same time. In several parts of the State there are large areas of locust. This blooms the latter part of May, and when conditions favor, yields for about eight days a heavy water-white honey. The clovers usually follow this, but are of consequence only under favorable conditions of rainfall, save in a few sections where soil conditions afford abundant moisture.

In many sections sumacs furnish the next crop, and where they are sufficiently abundant the beekeeper may rightly look for a good crop of a very fair honey.

In some of the more swampy and less settled sections, button bush, clethra (sweet pepper bush) and clematis yield a white and highly-flavored honey, that from clematis being of the very highest quality. But the yield from these plants is irregular, in some years being almost absent.

In some of the villages and cities the European lindens are numerous and yield heavily. The bloom ceases toward the end of the clover flow, though the time of flowering of different trees in the same neighborhood varies greatly. Native linden, basswood, is now found only in a few places. The season closes with the goldenrods and asters, which yield a rich, aromatic honey which, though not acceptable to many persons, commands a fancy price from others. The crop from these two sources is not always to be depended upon, being more affected by the weather than some of the others.—Arthur C. Miller, Bulletin, State Board of Agriculture.

**RHODODENDRON, see Azalea.**
**RHUS, see Sumac.**
**RICHARDIA, see Mexican Clover.**
**ROBINIA, see Locust.**

**ROCKBRUSH (Eysenhardtia amorphoides).**

Rockbrush is a small shrub common to southern and western Texas, and extending into Mexico. It blooms after heavy rains, several times during the year, and yields honey in surplus quantity. It is reported frequently throughout the region south and west of San Antonio to the Rio Grande.

**Colubrina Texensis,** an entirely different shrub, which is common from the Colorado River to the Rio Grande and west to New Mexico, is also known by the name of rockbrush. It is reported as yielding both pollen and nectar, but not as a source of surplus honey.

**ROCKY MOUNTAIN BEE PLANT (Cleome integrifolia).**

The Rocky Mountain bee plant, also known as stinking clover (Fig. 120), is principally confined in its distributions to the plains region west of the Missouri River. It is also reported from north Pacific Coast States. While it is a dry land plant, it is occasionally reported from Illinois, Iowa and Minnesota. Although it is occasionally seen elsewhere, the author has not seen it in Iowa excepting on the Missouri River bluffs, where it is plentiful in some localities. This plant is reported as especially valuable in Colorado, where it is said to produce considerable quantities of honey.

It is an annual with large, showy, pink or purple flowers. At one time there was much interest in this plant on the part of eastern beekeepers who tried to introduce it by sowing seed. At the Michigan Agricultural College a small field was planted to ascertain whether it could be grown profitably for honey alone. As no plant has as yet proven to be sufficiently valuable to justify its cultivation for this purpose exclusively, it is not surprising that the Rocky Mountain bee plant did not prove to be an exception. It is acrid and pungent and said to be distasteful to animals, which seldom eat it. If the plant had any value for any purpose besides honey production, an effort to extend the area of the distribution might succeed, but the introduction of plants that are essentially weeds in their nature seldom meets with favor.

According to Frank Rauchfuss, the cleome is erratic in its yield. If

there is a wet spring the seeds germinate early. When this is followed with good rains in June the plants are vigorous and spreading in their growth and each will have many blossoms. One year he extracted an average of 116 pounds per colony from a ten-days' flow. The honey is white in color, with a greenish tinge. It has a rather sickening flavor when fresh, but improves with age. When pure it is a first quality honey. It is rare that a good crop is secured from his source.

The plant thrives best on sandy and gravelly soils.

Fig. 120. Cleome, or Rocky Mountain bee plant.

**ROMAN CANDLE, see Yucca.**

**ROSE (Rosa).**

There are many species of roses of wide distribution. They yield pollen abundantly and are frequently valuable, in localities where they bloom when pollen is scarce. There are numerous reports of rose honey. but in most cases the observer has probably mistaken the object of the bees when working on the flowers. Several competent observers credit the Cherokee rose as a source of nectar. (See Cherokee Rose.)

"Some time ago quite a discussion was brought about by the assertion of Gaston Bonnier, that one never saw bees upon roses, no matter how colored or how fragrant. Dr. Miller replied that he had often seen them upon the crimson ramblers and that they even tore the buds open.

"The magazine 'L'Abeille de l'Aube,' in its August number quotes the different assertions which were made upon the subject since then in Europe.

"Mr. Bonnier came back with the assertion that the bees were only hunting pollen, for, according to him, there is no nectar in roses.

"Joan Ruppin, of Fountenay-Aux-Roses, saw his bees take pollen on the roses, but never any nectar.

"A. Martinot saw the bees often on the crimson ramblers and on other similar roses, never on the double flowers.

"Mr. Pitrat believes they find both nectar and pollen on the simple flowers.

"Louis Rosseil, Consul of Belgium in Athens, says that in the Island of Eubia, the bees work upon fields of roses and produce a white honey much esteemed."—American Bee Journal, October, 1912.

Beekeepers in the Rocky Mountains of Colorado and on the Pacific Coast report that their bees get honey from roses.

**ROSIN WEED, see Cup Plant, also Gum Weed.**

**ROYAL PALM, see Palm.**

**RUBUS, see Raspberry.**

**RUDBECKIA, see Coneflower.**

**RUSSIAN OLIVE, see Oleaster.**

# S

**SABAL, see Palmetto.**

**SAGE (Salvia).**

When sage is mentioned, we of the east are likely to think of the common garden sage **(Salvia officinalis),** which for at least three centuries has been cultivated for its aromatic leaves. Of this there are several varieties, some with broad and some with narrow leaves. The garden sages are good honey plants, but seldom sufficiently abundant to amount to much as honey producers. The honey from the garden sage is said to be nice and white like that from catnip or motherwort.

The name sage is derived from its supposed power to make people wise by strengthening the memory, for which it was used in ancient medicine.

There are upwards of five hundred species of sages, widely distributed in the temperate and warmer regions of both hemispheres. Probably most of the species yield honey, although but few are known to be important. Rayment mentions the wild sage **(Salvia verbenacea)** as introduced into Australia from Europe, but now yielding honey during the dry months of the year. (Money in bees in Australasia.) There are more than two hundred species known to occur in Mexico and Central America and it is very probable that when beekeeping is developed on a commercial scale in those countries, the sages will be found to be very important honey plants.

Fig. 121. White sage is uncertain in its yield.

Since practically all sage honey that goes to market in America is from California, the sages from that State are of first importance. Sage is known to occur in other Western States and the question is sometimes asked whether any honey is secured from this source elsewhere. In answer to this question Mr. J. E. Miller, of Caldwell, Idaho, writes, in Gleanings in Bee Culture (September 15, 1908, as follows:

> "My neighbor, Mr. Garfield, experimented with one colony of bees by taking it eight or nine miles away from alfalfa or other cultivated fields, and setting it among the white sage. He went out to look after it every week and took fresh water. We do not know the exact amount of honey the bees gathered, but they did fully as well as those left at home near the alfalfa. The honey was of that water-white color peculiar to California sage honey. Mr. Garfield sent samples to California and it was pronounced A-1 white sage; so we are convinced that the white sage of Idaho does yield just as much and just as good honey as that of any other State."

It is probable that one or more species of sage occur in nearly every State, but they increase in abundance westward. In the arid country west of the Missouri River they become sufficiently common so that an appreciable amount of honey might be expected in many localities. It is quite likely that sage honey in small amounts is mixed with honey from other sources, and so not detected, in many many localities outside of California. The fact remains, nevertheless, that sage, as an important source of surplus, is not reported outside of that State.

The quality of sage honey is of the best, being water-white in color, of a heavy body and delightful flavor. Since it does not granulate, it is much sought for by bottlers in the east, who blend it with clover or alfalfa. There are many who regard sage honey as the finest in the market. In this connection A. I. Root, in an early edition of his A B C of Bee Culture, wrote:

> "I well remember the first taste I had of the mountain sage honey. Mr. Langstroth was visiting me at the time, and his exclamations were much like my own, only that he declared that it was almost identical in flavor with the famed honey of Hymettus, of which he had received a sample some years ago. Well, this honey of Hymettus, which has been celebrated both in prose and poetry for ages past, was gathered from the mountain thyme, and the botany tells us that thyme and sage are closely related."

Although there are several species of sage which yield honey in California, the quality does not differ materially, as far as can be ascertained from printed reports. It is all described as "water-white, unexcelled flavor, of heavy body and does not granulate."

Prof. A. J. Cook wrote to the American Bee Journal (June 21, 1906) concerning the sage as follows:

> "Chief among the honey-bearing mints are the incomparable sages of California. These are not excelled even by the clovers or linden. The honey is white, delicate of flavor, and must ever rank among the best in appearance and quality. Not only this, but the quantity is often phenomenal. This comes from the fact that flowers are borne in long racemes of compact heads, and as the separated flowerets do not bloom all at once, but in succession, the plants are in bloom for weeks. The sages, then, are marvelous honey producers, first, because of the gen-

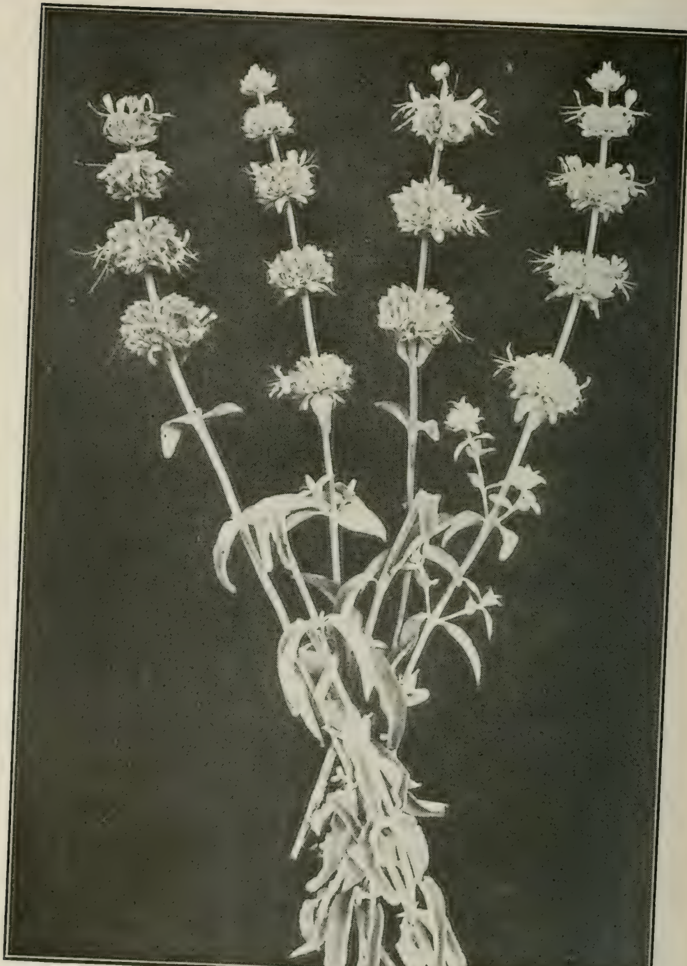


Fig. 122. Black sage is the finest honey plant on the Pacific Coast.

erous secretions of each floweret, and second, because of the immense number of these flowerets and the long period of bloom."

At another time Mr. Cook wrote that the honey from all sages is so much alike that it would be indistinguishable.—American Bee Journal, August 3, 1905.

Richter, in his Honey Plants of California, speaks of the white sage **(Salvia apiana)** Jep., as "very common on the dry plains toward the foothills, and ascending these to about 3,000 feet." (Fig. 121).

Writing in Gleanings in Bee Culture, P. C. Chadwick describes a journey which he made in the San Bernardino Mountains with the intent to find out the highest elevation at which bloom could be found in sufficient quantities to support bees. Up to an elevation of 7,000 feet he found white sage in abundance, and all alive with bees. (Western Honey Bee, September, 1914.) Richter gives its range as common from Santa Barbara County southward, blooming from April to July. "As abundant as the black sage, but not as good a yielder, nor has the honey as fine a flavor."

Black sage **(Salvia mellifera),** Greene, also known as ball sage, or button sage (Fig. 122), is generally credited as being the principal source of sage honey, most of the honey which goes to market under the name of white sage being produced from this plant. Quite probably it is the best honey plant on the Pacific Coast. Richter says of it: "As a general rule, every fifth year an excellent crop is obtained, and every third or fourth year a total failure is experienced, the flow being dependent upon winter rains, with warm spring quite free from cold winds and fog. When in bloom a certain amount of warm weather is required before it produces nectar."

The range of black sage is given as "Mt. Diablo, Los Trampas Ridge, near Hayward, San Mateo County, Glenwood and Brieta, southward to southern California. April-May." (Jepson). "Coast ranges and ascending to 5,000 feet in the San Bernardino Mountains. March to June. San Diego County, February to May."

Mr. J. E. Pleasants, of Orange, California, writing in American Bee Journal (June, 1914) describes the peculiarities of the sages as follows:

> "The black sage is king of them all. When climatic conditions are favorable I think black sage can be relied upon to produce more 'gilt edge' than any other plant in the West, and for body and flavor it is hard to excel. It blooms for weeks. The blossom is small and inconspicuous, but what a flow of nectar it can yield.
>
> "The white sage is a much prettier plant. Its soft, grey leaves and tall blossom spikes make it quite showy, while its pleasing aromatic odor breathes the very essence of wild perfumes. But this queenly plant is much more inconstant than its plainer sister. Some years it produces a good harvest, others very light.
>
> "The silver or purple sage, which has silvery leaves and brilliant light purple blossoms, is usually a good producer, but is much restricted as to locality."

The purple sage **(Salvia leucophylla)** (Fig. 123), also called white-leaved sage, or silver sage, is reported as a good yielder, although not as abundant as either of the foregoing species. The Richter catalog gives the range as occasional in the foothills of the Santa Monica and San Fernando Mountains, April to July, and from San Luis Obispo to San Diego Counties and not extending inland beyond the coast ranges.

Fig. 123. The purple sage.

**Salvia amabilis,** loving sage, is reported from Santa Barbara, March-June, but probably not important.

**Salvia carduacea,** thistle or annual sage. "Inner coast range valleys and throughout the San Joaquin Valley, southern California, June." (Jepson). "A well-known honey plant." (Richter).

**Salvia columbariae,** annual sage. "Throughout the coast ranges, Sierra Nevada and southern California, on hill and mountain slopes." (Jepson).

**Salvia sonomensis,** Greene, creeping sage. "Montana species at middle

altitudes. Ramona Mountains west of Calistoga, Mt. Shasta, Calaveras and Mariposa Counties, San Diego County. May." (Jepson). "Also June, Sierra foothills from Sierra to Inyo Counties, main source of honey in many districts." (Richter).

Concerning the regularity of yield from sage, Mr. P. C. Chadwick wrote in Gleanings in Bee Culture (January 1, 1911), as follows:

> "South of the Tehachapi Mountains lies practically the entire sage of our State, notwithstanding eastern people and many of our westerners term every form of small growth on the vast slopes of the Rocky Mountains "sage brush.' There is no denying that the button (or black) sage is, of all honey plants, our chief surplus producer. Neither does it average a crop more often than every other year, regardless of rainfall, for it seems necessary, from its semi-arid nature, to be dried out or rested before it comes back to its prime yielding condition. I have seen it return some surplus for three consecutive seasons; but the middle season was not what could be considered a crop, even after a sufficient rainfall."

Again he writes to the same journal to the effect that the sage ranges soon give place to other crops (Dec. 15, 1911):

> "If I should predict that thirty years hence the sage ranges of California would be almost a thing of the past there would doubtless be criticism of my views; but I firmly believe that we shall face such a condition, for emigration to this part of California is increasing rapidly. Hillsides are yielding to the plow, where twenty years ago it would have been thought almost impossible."

Some writers give two hundred pounds per colony as a fair average in a good sage year, so that with even one good year in three it comes well up with the yield of many plants more constant in their production.

**SAINFOIN or ESPARCET (Onobrychis sativa).**

Sainfoin is grown to a limited extent in Canada, and although given numerous trials in various parts of the United States, has not, till the present, succeeded in establishing itself successfully. It is a splendid forage crop, somewhat similar to alfalfa, and is an important source of nectar in Italy and other parts of Europe.

Several years ago it was given an enthusiastic endorsement as a honey plant for America by John Fixter, at that time apiarist at the Central Experiment Farms at Ottawa, Canada. A test plot at the Farms proved so attractive to the bees that it attracted much attention on the part of eastern beekeepers. He reported that it yielded nectar in the morning and that the bees began work upon it fully an hour before they did on alsike or white clover. A further advantage was stated to be that the first bloom came between fruit bloom and white clover and the later bloom at a time when there was a dearth from other sources. On plots side by side he reported that there would be something like a hundred bees on the sainfoin to ten on the white clover.

In spite of the glowing accounts of its value and a general attempt to boom the plant, it failed to succeed. It should be remembered, however, that there was a general failure with alfalfa when first attempts were made to grow it in America, and it would seem worthy of further trial to

see whether there are not sections better adapted to its growth.

The following article by C. P. Dadant, reprinted from the American Bee Journal, page 790, 1904, will give some information about the value of the plant in European countries:

"Sainfoin, otherwise called esparcet, is widely cultivated in Europe, especially in France. Its name, "sainfoin," is French, and literally means "healthy hay"—sain-foin. It is a perennial, gives a splendid hay crop, and in some sections of the European continent it is a first-class honey-producer.

"The small province of France, formerly called "Gatinais," is the leading producer of sainfoin honey. According to the best authorities, the honey of Gatinais has the reputation of being of the whitest color and sweetest taste, and is said to be in no way surpassed by white clover honey.

"Gaston Bonnier, the eminent professor who was President of the International congress of beekeepers at Paris in 1900, says in his book, the 'Cours Complet d'Apiculture,' that sainfoin honey is one of the best appreciated grades. He ranks it next only to the honey of the Alpine hills of eastern France and Switzerland.

"From immemorial times the honey crops of Gatinais have been considered as leading in the amount of production, and this was all credited to the sainfoin, which is grown there in immense quantities, somewhat as alfalfa is grown in the irrigated plains of the West. It was in Gatinais that the custom of inverting hives began, in order to secure the largest possible quantity of honey from the bees, regardless of future consequences. For that reason the beekeepers of Gatinais were compelled to replenish apiaries every season with bees brought from away, as their only aim was to secure the largest possible quantity of sainfoin honey during the short period of the bloom, and many of their bees perished the following winter.

"Although sainfoin has already been tried in the United States with unfavorable results, I believe it is worth while to try it again, especially in the countries where alfalfa succeeds so well. It might prove a useful honey plant.

"We must, however, not close our eyes to the fact that honey plants do not yield honey in the same proportion in all localities. White clover, which is the source of so large a crop of white honey in this country, is absolutely useless as a honey producer in some other countries. Edouard Bertrand, the editor of the Revue Internationale, told me positively that there never had been any white clover honey harvested in Switzerland by any of his friends, although it is quite common in the Swiss meadows."

**SALAD-TREE, see Red-Bud.**

**SALAL (Gaultheria shallon).**

Salal is an evergreen shrub, one to five feet high, common from central California north to Washington. It grows abundantly in the redwood forests commonly covering the ground. The flowers occur in racemes three to six inches long and are pink or pinkish white.

It blooms with salmon-berry, wild blackberry and chittam, so the honey is seldom secured unmixed.

**SALIX, see Willow.**

**SALMON BERRY or THIMBLE BERRY (Rubacer parviflorus).**

The salmon berry or Thimble berry, also known as flowering raspberry, shown at Figure 124, is a well known honey plant on the Pacific Coast. It occurs along the coast from Alaska to Mexico. It also occurs in the mountains as far south as Colorado and New Mexico. It is a shrub with erect stem and red fruit. It is known to some extent in Ontario west to Dakota.

Salmon berry is frequently mentioned as a source of honey in the Pacific Northwest, especially in Washington, Oregon and British Columbia.

Fig. 124. Salmon berry, or thimble berry.

**SALT CEDAR (Tamarix gallica).**

Scholl's Bulletin lists the salt cedar as a source of honey in Texas. "Common European shrub which seems to have escaped in many places in Texas." (Coulter). "On roadsides, in thickets and waste places in warmer parts of southern United States, naturalized from southern Europe." (Small.) The author has reports of this plant being common in the vicinity of Corpus Christi, Texas. Reported also as a honey plant in places in California.

**SANDVINE, see Bluevine.**

**SAPINDUS, see Wild China.**

**SASKATCHEWAN—Honey Sources of.**

The sources of nectar, in the order of their importance, are fireweed, wolfberry, prairie flowers, alsike and white clover and Siberian pea-tree. Willows and maples for early brood rearing are important.—F. W. L. Sladen.

**SASSAFRAS (Sassafras officinale).**

Sassafras is an exceedingly well-known tree in the Southwestern States. It is known occasionally as far north as Ontario and Massachusetts southward to southeastern Iowa, eastern Kansas and south to the Brazos Valley in Texas. It is a conspicuous feature of the old fields of the southern plantations. It has spicy aromatic bark and mucilaginous buds and leaves which many people enjoy chewing. Oil of sassafras is distilled from the roots.

The flowers are small, yellow and inconspicuous, but are attractive to the bees. The writer has found occasional reports of bees working on sassafras in the Southern States. At Buffalo, Texas, it is reported as blooming about two weeks. H. B. Parks reports that it yields well in Missouri. The blooming period is early and short, hence its principal value is for spring brood rearing. It was blooming with willow on March 20, 1918, in Leon County, Texas, when the author visited that section, and the bees were apparently getting considerable nectar from sassafras at that time.

**SATUREJA, see Wild Pennyroyal.**
**SAW PALMETTO, see Palmetto.**

**SCILLA.**

The **Scilla siberica,** or Siberian squill, is an early blooming old world flower commonly naturalized in the grass of lawns, parks, etc., for ornamental purposes. It has small blue flowers which appear as soon as the ground is free from frost in the spring. The bees seek them eagerly and, coming at a time when little is to be had, they keep the bees busy on the few sunny days of early spring. Flower lovers will find this plant a desirable addition to their garden list. Aside from planting the bulbs no care is necessary. It will thrive in a stiff bluegrass sod, where few other plants would grow. It is only necessary to avoid cutting the grass till the plants have matured.

**SCROPHULARIA, see Figwort.**
**SCRUB PALMETTO, see Palmetto.**
**SENSITIVE PEA, see Partridge Pea.**
**SHEEP LAUREL, see Laurel.**
**SHITTIM-WOOD, see Gum Elastic.**
**SHOESTRING VINE, see Bluevine.**
**SHRUBBY TREFOIL, see Hop-Tree.**

Fig. 125. The blossoms of Siberian squill are attractive to the bees in early spring.

**SIBERIAN SQUILL, see Scilla.**
**SILKWEED, see Milkweed.**
**SILPHIUM, see Cup Plant.**
**SILVERBERRY, see Oleaster.**
**SIMPSON'S HONEY PLANT, see Figwort.**

**SKUNK CABBAGE (Symplocarpus foetidus).**

The skunk cabbage is found in wet places from Nova Scotia to North Carolina and west to Iowa. It receives its name from the strong odor which it gives off. Skunk cabbage is one of the very first plants to bloom as frost is leaving the ground in spring, and its principal value to the beekeeper comes from this early appearance. The late G. M. Doolittle wrote (Gleanings, 1909, page 200) that he had seen the bees gathering pollen from this plant when the temperature stood at 42 degrees. He stated further that he valued it more highly than any other pollen-yielding plant or tree, and that there was nothing with which he was familiar so eagerly sought by the bees, nor any source of pollen which so greatly stimulated brood rearing.

**SMARTWEED, see Heartsease.**
**SNEEZEWEED, see Bitterweed.**

**SNOWBERRY (Symphoricarpos racemosus). WAXBERRY.**

The snowberry is a low branching shrub with conspicuous white berries which hang on through most of the winter. It is of wide distribution in the Northern States from New England and Pennsylvania to the North

Pacific Coast. It is also common in the hill country of much of California, in the White Mountains of New Mexico and in parts of Colorado and other mountain States. The blossoms are small and inconspicuous, but they are attractive to the bees, nevertheless. The snowberry is a valuable plant in many localities in the West, but is of special importance in Washington and British Columbia. There it is reported as blooming during the last half of June and well into July and as furnishing an important secondary flow. According to H. A. Scullen it is very important in northern Idaho and in Stevens County, Washington, the bees work upon it in preference to white clover.

Snowberry is a close relative of Indian currant and is illustrated in connection with that plant. (See Indian Currant).

**SNOW-ON-THE-MOUNTAIN (Euphorbia marginata). SPURGE.**

Snow-on-the-Mountain is a showy plant easily recognized by the white margined leaves. It is native from Minnesota to Montana and south to New Mexico and Texas. It is also cultivated for the peculiar foliage. It is probably nowhere important as a honey plant, and is of special interest from the fact that its nectar is so often reported as poisonous. (See Poisonous Honey.)

Fig. 126. Soapbush (*Guaiacum angustifolium*).

**SNOWVINE or PEPPER-VINE (Cissus arborea).**

The snowvine is a climbing vine with heart-shaped leaves, and berries the size of a pea, and which are edible. It is common in the low borders

of woods and along streams from Virginia to southern Illinois and southward to Florida and eastern Texas. It is a relative of the cowitch. (See Cowitch). It is common in Alabama and Georgia from the central belt to the coast plain, where it begins to bloom in June. It is reported as being the source of considerable honey of fair quality.

**SOAPBERRY, see Wild China.**

**SOAPBUSH (Guaiacum angustifolium).**

The soapbush is native to the dry lands of south Texas and northern Mexico. It blooms after rains in both spring and fall. At Crystal City, Texas, it is reported as the source of the first honey in spring, coming in March. Beekeepers report that with very little moisture soapbush can be depended upon for honey and that it yields nectar every time it blooms. The honey is of fine quality, mild flavor and light color. The flow lasts from ten to fifteen days. (Fig. 126.) The soapbush has very hard wood, crooked and knotty branches and in places becomes a small tree and is known as lignum-vitae.

**SOLIDAGO, see Goldenrod.**

**SORGHUM.**

The sorghums are widely planted as forage crops. They yield pollen in great abundance and at times honeydew is gathered from this source, also.

**SORREL-TREE, see Sourwood.**
**SOULARD CRAB APPLE, see Crab Apple.**
**SOUR-GUM, see Tupelo.**
**SOUR-TOP, see Blueberry.**

**SOURWOOD (Oxydendrum arboreum).**

The sourwood tree reaches a height of thirty to forty feet and a diameter of twelve inches, on high lands, but seldom exceeds twenty feet in height on the low lands. It is a common tree from West Virginia to north Georgia and west to Arkansas. The white flowers grow in racemes and appear in July. It is sometimes called sorrel tree, because of the acidity of its leaves. The wood is soft and is not of much value except for light fuel.

Sourwood honey ranks high, both in quality and in quantity of yield. Many people regard it as the finest honey produced in America. It is light in color, of heavy body, fine flavor and slow to granulate. The bloom lasts from two to three weeks and comes in mid-summer, when bees have ample time to build up to maximum strength for the flow. Although sourwood honey is produced in limited areas in several States. North Carolina and eastern Tennessee probably contain the finest forests and remarkable yields are sometimes reported in this region. The crop from this source seldom fails and it is regarded as one of the most dependable sources of nectar. A lady beekeeper, writing from North Carolina, stated in the

American Bee Journal that she had never known it to fail. An average of as high as 75 pounds per colony from sourwood has been reported and the local demand usually takes it all at prices above the open market.

**SOUTH CAROLINA—Honey Sources of.**

Willows, fruit blossoms, including such wild fruits as hawthorne, huckleberry and blackberry, furnish abundant nectar for early spring. Tulip-tree, sourwood and clover, persimmon, black-gum and holly are all good sources of nectar. Cotton may be expected to yield also on suitable soils. (See also North Carolina and Georgia for a longer list of plants likely to be of value in this State.)

**SOUTH DAKOTA—Honey Sources of.**

The best beekeeping territory in South Dakota is in the sweet clover districts in the southeastern part of the State. In this region large crops of fine honey are secured.

Maples and willows, dandelions and fruit blossoms start the bees off in the spring. White clover and alsike both yield well in the eastern part of the State. Sweet clover is important wherever grown and alfalfa is valuable in some localities. Heartsease is the principal source of honey in late fall. There are also many minor sources, such as are common to the Middle West.

**SOUTHERN BUCKTHORN, see Coma.**
**SOUTHERN CRAB APPLE, see Crab Apple.**

**SOW THISTLE (Sonchus).**

The sow thistles are weeds which are widely distributed from eastern Canada to Florida and from British Columbia to California. They are reported as valuable in east Texas, and Richter lists two species as yielding nectar in California. Probably seldom important.

**SPANISH BAYONET, see Yucca.**
**SPANISH DAGGER, see Yucca.**

**SPANISH NEEDLE (Bidens).**

The Spanish needles, also known as bootjacks, beggar ticks, stick tights and marigolds, are very widely distributed plants, and are of interest to the beekeepers from Nova Scotia to California. Most of the species are weeds growing commonly on low and swampy lands. Not all of them produce honey in appreciable quantity, and possibly some of them are not sought by the bees at all. Figure 128 shows **Bidens aristosa,** which has an attractive yellow flower and is most frequently mentioned as a source of honey. This is particularly valuable on the lowlands along the Mississippi and Missouri Rivers. During the seasons of 1915 and 1919 much honey was gathered from it.

Two species are reported among the honey plants of California by Richter, **B. frondosa** and **B. pilosa.** The former is one of the most widely-

distributed species and closely resembles the one shown, but has a wider leaf. **Frondosa** is seldom reported as yielding nectar, and it is of doubtful value to the beekeeper.

Figure 127 shows the western bur-marigold **(B. involucrata),** which occurs from Illinois and Iowa south to Texas and Louisiana. This is reported as a good honey plant. This flower has no colored corolla, but is surrounded by greenish rays. August is the month of flowering with this

Fig. 127. Western bur marigold.

species. The Spanish needles are all late bloomers, and where they occur yield nectar, and add something to the fall honey flow.

**SPARKLE-BERRY, see Farkle-Berry.**
**SPICEWOOD, see Dogwood.**

**SPIDER PLANT (Cleome spinosa).**

The spider plant is a close relative of the Rocky Mountain bee plant and very similar in habit. The spider plant had quite a boom among beekeepers of a few years ago. The seed was sold quite generally and planted in gardens, but as it is of no value except for honey and as an ornamental, its popularity soon declined and it is seldom mentioned of late. It secretes nectar abundantly and the bees work upon it freely just at nightfall, and again in early morning. It is a native of the tropics and has escaped and run wild in many places from North Carolina to Arkansas and Louisiana.

Much has been written about the remarkable secretion by this plant and the excitement it causes among the bees. Under favorable conditions it is one of the very best of honey plants and, if sufficiently common, would no doubt be the source of large quantities of surplus honey. There are reports to the effect that spider plant grows abundantly in neglected fields in some localities in southeastern Missouri and is there important. It is said to require a rich soil for best results in nectar secretion. A single blossom secretes nectar so freely that a bee often finds a drop larger than it can carry at one load.

Fig. 128. Spanish needle (*Bidens aristosa*).

**SPIKEWEED (Centromadia pungens).**

Spikeweed is a common plant in California, where its range is given by Jepson as follows:

> "Abundant on the plains of the lower San Joaquin southward to southern California and westward to Walnut Creek and Alameda. On the alkaline plains of the upper San Joaquin this species covers tens of thousands of acres and often forms thickets four or five feet high. It is abundant in the low, more or less alkaline plains of Solano County and forms extensive colonies in summer fields. Extermination is often accomplished by means of bands of sheep, which leave the fields perfectly clean and destitute of this spikeweed pest.—Flora of Western Middle California.

According to Richter, carloads of honey from spikeweed are shipped

annually from Fresno County, the honey being of amber color, good quality and quick to granulate. He states that other plants are replacing spikeweed to such an extent that it is no longer of the importance which it was in the past.

**SPOON-WOOD, see Laurel.**

Fig. 129. The bees seek the spring beauty in early spring.

**SPRING BEAUTY (Claytonia Virginica).**

The spring beauty is one of the early spring flowers common in open woodlands from Nova Scotia and New Brunswick to Ontario, Saskatchewan and Alaska and from New England west to Minnesota and Nebraska and south to Georgia and Arkansas. Appearing so early in spring it is much sought by the bees at a time when there is little of either nectar or pollen available. At a later season it would be of such slight value as to be hardly worthy of notice on the part of the beekeeper. Figure 129 shows a bee on the blossom of a spring beauty.

**SPRUCE (Picea abies).**

For years past there has been an occasional mention in our beekeeping literature of spruce honey, or of bees working on spruce. As far as the writer has been able to ascertain this is true only of the Norway spruce. Since the Norway spruce is not a native of this country, it is seldom found

in considerable numbers except in the vicinity of cities, where it is planted freely for ornament. (Fig. 130.)

It was at the Ontario Agricultural College at Guelph that the writer first saw the bees working on spruce to any extent. It was about June 12, and the bees were humming through these trees in large numbers. There

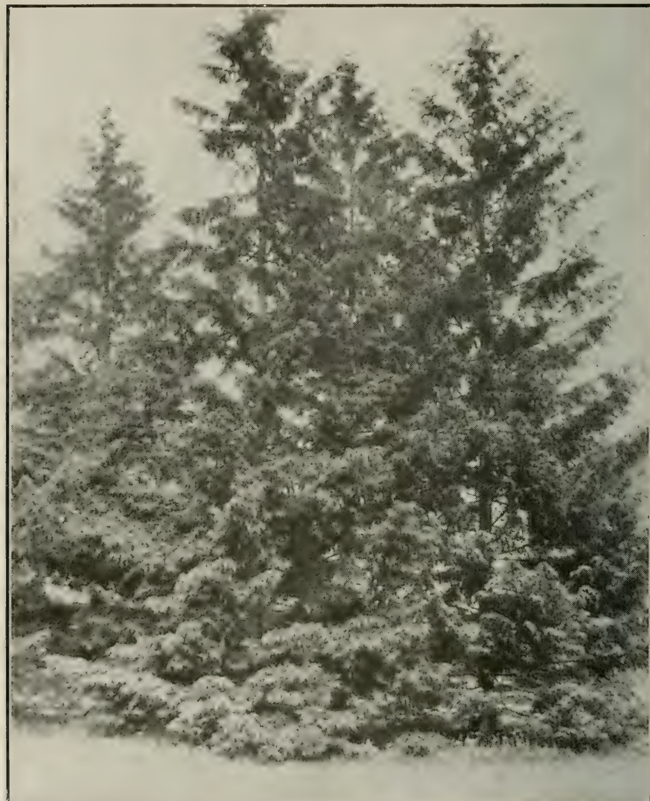


Fig. 130. The Norway spruce is the source of honeydew.

are hundreds of these trees about the college grounds, and considerable honeydew seemed to be coming to the college apiary from this source. Honeydew is seldom desirable, as it is usually of poor quality and only serves to spoil the quality of good honey. However, this spruce honeydew seemed to be of rather better quality than is generally the case with

honeydew, and, as it came ahead of the clover flow, was probably nearly all consumed for brood rearing.

For a time the writer was puzzled to know whether the bees were getting an exudation of sap from the tree, or were in fact getting honeydew. They were working on what appeared at first sight to be buds at the base of the new growth, but which under the microscope proved to be insects identified as **Physokermes picea.**

**SPURGE, see Snow-on-the-Mountain.**

Fig. 131. Yellow star thistle.

**SQUASH (Curcurbita maxim),** also **(C. moschata).**

Squashes are widely cultivated for food. There are numerous varieties, but all are valuable sources of pollen and nectar. They secrete nectar freely, and where sufficiently abundant, a considerable quantity of honey is stored.

**STAR THISTLE or KNAPWEED (Centaurea). BARNABY'S THISTLE.**

There are several species of star thistles or knapweeds widely distributed. The yellow star thistle **(Centaurea solstitialis)** (Fig. 131) is an introduced species from Europe that occurs from Massachusetts and Ontario, west to Iowa. It is also common in parts of California. It is only from the latter State that it is reported as an important honey plant. According to C. D. Stuart (American Bee Journal, page 340, October, 1918),

it furnishes from one-third to one-half of Butte County, California's honey crop, an average of about sixty tons. Concerning the plant he writes as follows:

> "Star thistle begins to bloom about the first of July and continues till frost, which usually comes between October 1 and November 1. The yield of nectar is slow but continuous. If it is stopped by drought it will start yielding nectar again after a rain. The plant has the faculty of existing in arid soils for long periods of drought, and when apparently dried up, it will start to grow and blossom after a rain. Some cattle growers find that thistle hay can be fed profitably when cut and dried like other hay, if it is moistened before feeding. The dampening of the fodder takes the sting out of the leaves and blossoms.
>
> "Star-thistle honey is heavy-bodied, white, almost cloying in its sweetness as orange, and has a greenish yellow tinge, like olive oil. It is considered by large buyers equal in quality to any white honey in the State, and with the price at two cents a pound more than light amber of the alfalfa type, and still rising, beemen in northern California should worry."

Richter lists Napa-thistle or tocalote **(Centaurea melitensis)** as yielding light amber honey of good flavor and fair body in Sacramento County, from May 15 to June 15. It is regarded as a bad weed and is abundant everywhere in fields and pastures. Like the foregoing, it has been disseminated with seed grain and grass seed. According to Richter, it does not yield nectar in southern California. Scholl lists American knapweed **(Centaurea Americana)** as not important in Texas.

**STICKLEAF, see Mentzelia.**

**STICK-TIGHT, see Spanish Needle.**

**STINKING CLOVER, see Rocky Mountain Bee Plant.**

**STINKWEED, see Jackass Clover.**

**STONECROP (Sedum pulchellum).**

Stonecrop is common from Virginia to Arkansas and south to Georgia. It is abundant in many localities and is reported to be a valuable honey plant in the South.

**STORK'S BILL, see Pin Clover.**

**STRAWBERRY (Fragaria).**

The wild strawberries are seldom sufficiently abundant to be of much value to the bees, but the cultivated varieties are grown in large plantations and are the source of both pollen and nectar. They bloom in early spring, for the most part, although some of the everbearing varieties continue to blossom through the summer. Strawberries, like most other fruits are of principal value to stimulate early brood rearing.

The bees are very important to the strawberry growers, as many varieties of strawberries are not self-pollinating or are deficient in stamens. The bees carry the pollen from the staminate blossoms to the pistils of the incomplete flowers.

**STRINGY BARK, see Eucalyptus.**

**SUGAR GUM, see Eucalyptus.**

**SWEET CLOVER (Melilotus).**

There are probably twenty species of melilotus native to the temperate regions of Europe and western Asia. Several have been introduced

Fig. 132. Blossoms of white sweet clover (*Melilotus alba.*)

into America. Of these, two species, the white sweet clover **(Melilotus alba)** and the yellow sweet clover **(Melilotus officinalis)** are valuable plants and are widely distributed. The yellow variety blooms about two weeks earlier than the white and where both are present a long honey flow may be expected.

Sweet clover reaches the highest development in the secretion of nectar in the hot, dry summer climate of the plains region between the Missis-

sippi River and the Rocky Mountains. In the East, the surplus secured from this plant has been disappointing, and eastern men insist that sweet clover is overrated as a honey plant. However, those who have seen the big flows that are frequent along the Missouri River and westward are enthusiastic in its praise. In the region about Sioux City, Iowa, it is grown extensively as a farm crop. In this section an average of 200 pounds surplus per colony from sweet clover is not uncommon. On the limestone soils of Alabama and Mississippi it also yields freely and large yields are reported. In the irrigated regions of the West it is of great importance and beekeepers who ship sweet clover honey in carlots are not uncommon.

The quality of the honey is excellent. It is light in color and mild in flavor, although slightly peppery to the taste. It granulates more readily than white clover, but is regarded as of number one quality in the principal markets.

### Sweet Clover as a Farm Crop

When our older readers were beginners in the beekeeping business it was a popular thing for the beekeepers to buy sweet clover seed and stealthily sow it along the roadsides. So general was this practiced that whenever the plant appeared in a new locality it was generally charged up to the beekeepers living nearby. So great was the prejudice against the plant that much ill-feeling developed in some places because of it. It even went so far that in some States it was placed on the list of noxious weeds and its eradication required by law. When Frank Coverdale, well-known Iowa farmer who did so much to popularize sweet clover, first sowed it in his own fields, neighbors called on the county attorney to enquire whether he could not be prosecuted for sowing weed seed. For a generation the beekeepers kept up the fight, and constantly preached that sweet clover was not a weed, but a valuable forage plant. It remained for men like Coverdale, who were both beekeepers and farmers, to prove the assertion and convince the unwilling public, by making as much profit from sweet clover pasture for forage as the neighbors could make from other farm crops.

It was on poor lands which had been worn out by bad tillage, that the plant made the best showing. When lands which had been lying idle, because no other crop could be raised profitably, were made to produce good yields of milk, butter and beef from sweet clover, the neighbors were inclined to give it a trial on their own poor lands. The change in sentiment has been very marked during the past few years and now the demand for sweet clover seed is greater than the supply, and will continue so for several years, since the area where it is being grown is constantly being enlarged. There are large areas where sweet clover is grown generally as a farm crop, in Kentucky, Nebraska and Kansas. The increased acreage of this plant will double the possibilities of honey production in most any locality, and in numerous instances will treble and quadruple it. In the early years of his experience, Coverdale kept bees in several outapiaries, so that much travel back and forth was necessary. Since sweet clover has become so generally grown in his locality, he is able to keep three hundred

colonies in one yard in his orchard, where they are under his immediate care at all times. After traveling over much of the Central West, it has become apparent to the author that within a few years the beekeeping possibilities of parts of Kansas, Nebraska and South Dakota will be almost inexhaustible because of the increase of this plant. On visiting Falmouth, Ky., I was amazed at the stories they told of what sweet clover had done for that region. One of the pioneer growers was E. E. Barton, and his experience with it sounded like a fairy tale. Mr. Barton said that following the civil war, most of Pendleton County was given over to tobacco growing, with little live stock, and not much rotation of crops. It was a hill country, and although it had a fertile soil over a clay subsoil, the heavy rains soon washed away the shallow surface soil, and one farm after another was abandoned. Hundreds of farms were abandoned, and many of them were sold for taxes, because no buyers could be found. More than a third of the population left the county, and the farmers who remained had hard lines to make ends meet. Sweet clover was stealthily sowed, probably by beekeepers intent on increasing the bee pasturage. At first it was regarded with disfavor and fought as a dangerous weed.

Mr. Barton came into possession of a farm, somewhat against his will, because the owner could not pay the mortgage. He tried renting it, and the tenant was unable to make a living, much less pay the rent. After it had been abandoned, he went to great trouble to keep down the weeds, especially sweet clover. Then came a year of drought, when there was very little feed for the cattle, and they were turned into the roads to graze. Even there there was but little except the sweet clover, which was by this time rather common along the roadsides. It was soon noticed that the cows were eating the sweet clover with relish and doing well. Then somebody tried an experiment by sowing it in a field. It thrived, the cows liked it, and the milk flow was increased. Mr. Barton by this time was quite ready to profit by the experience, and within five years the farm which would not grow grass was producing good crops. He bought more abandoned farms and sowed them to sweet clover, and his neighbors began to do likewise. One by one the farmers came back to their abandoned farms, new settlers came in, and everybody began to grow sweet clover. Now there are fifty thousand acres of it in that county. Ask any farmer you meet on the streets of Falmouth what he thinks of sweet clover and he will tell you such tales of rebuilt fortunes from a combination of dairy cows and sweet clover as you never expect to hear. There are now shipped from the county about half a million pounds of seed yearly, besides thousands of dollars' worth of dairy products every week. They find that an average of 300 to 600 pounds of hulled seed per acre can be secured from the white variety and 500 to 700 pounds of the yellow. An average yield of from $40 to $100 per acre is the return from the sweet clover, according to local reports picked up on the streets. Now one finds evidences of prosperity on every hand. The farmers have fine homes, automobiles, and money in the bank.

**Soil Requirements.**

There is no forage plant that will succeed on such a wide range of soil

conditions as will sweet clover. It will succeed under unfavorable conditions on the heaviest clays and on light sand. It will grow on hardpan and on gravelly and stony land unsuited for general cultivation. It does well on soils too wet for either alfalfa or red clover and on soils so dry that neither of these will succeed. It will grow on land so poor and devoid of humus that no other clover or grass will grow. It is the greatest soil builder known, and now that the public has finally accepted the fact that it is not a noxious weed, it will shortly be used to redeem untold thousands of acres of otherwise waste land. It grows all the way from sea level to the mountain sides, and is spreading in the semi-arid sections of Colorado and other Western States, where the annual rainfall is very light.

In the October, 1917, number of the American Bee Journal has been told the story of the sweet clover region of Alabama and Mississippi. In those States sweet clover has spread over thousands of acres of land which had been abandoned for agricultural purposes; and it is not only furnishing abundant pasturage to the bees, but is restoring the fertility of these worn-out plantations.

The growth of the plant, however, is no longer confined to the roadsides and worn-out fields, but farmers are growing it successfully and profitably on lands worth $300 per acre in Iowa and Illinois, because it pays them to do so. In some cases the railroad companies have discovered that sweet clover growing along the right of way is the best possible insurance against erosion of the roadbed. A heavy growth of sweet clover protects the banks from the washing of heavy rains, as no other plant will do. In places, one can see a continuous strip of sweet clover for miles and miles along the railroads. It would seem the part of wisdom for the beekeepers' associations to bring this fact to the attention of the men in charge of keeping the lines in repair wherever possible. Once established along the railroads, it is bound to spread more or less along the byroads and into the fields, thus increasing the supply of forage within reach of the bees.

One of the most useful purposes which sweet clover serves is to smother out obnoxious weeds. So persistent is the plant where sowed in waste places that there are few weeds which can compete with it. Where bad weeds are present in old lots, along roadsides, etc., the easiest way to eradicate them is by sowing sweet clover freely. Within a few years the sweet clover will generally crowd them out. In spite of this fact, sweet clover itself is one of the easiest plants to destroy. Since it only lives two years and must come again from the seed after that time, all that is necessary to clear the ground of sweet clover is to cut it low when in blossom and before the seeds are formed.

Where there is difficulty in establishing alfalfa, sweet clover is often grown in advance to establish the nitrogen-gathering bacteria, which are peculiar to the leguminous plants. Following sweet clover, there is usually little difficulty in getting the alfalfa to grow, if the seed bed is carefully prepared. However, many farmers who have been growing both plants, are of the opinion that sweet clover is the more profitable of the two, and that it can be handled successfully with less difficulty.

There is no pasture crop which will support as many cattle or other live stock as will sweet clover during the second season of its growth. A small experimental plot of little more than an acre yielded two big loads of hay. The plants were permitted to get a good start after the hay was cut before pasturing, then two cows and a horse were turned in for the rest of the season. In addition to furnishing an abundant pasture for three, more than twenty bags of seed were secured. Allowing $15 per ton for hay, $1 a month per head for pasture, and $3 a bag for the seed, all very conservative figures, the crop returned about $96 per acre. While this small plot was experimental, there are numerous farmers who have received more than $100 an acre for seed alone.

### Cultural Requirements.

It frequently happens that, having seen sweet clover growing along the roadsides, on gravelly banks and other unpromising situations, we are surprised to fail in getting a stand in a well prepared field. Sweet clover requires a firm seed bed, and will not succeed on land where the soil has been deeply stirred and left in a loose condition. It is well to scratch the surface with a tool that does not penetrate deeply, leaving the surface loose for an inch or so, and compact below. While it will succeed on a great variety of soils, it requires that they be in a well settled condition and not freshly plowed to a depth of several inches, such as best suits many forage plants. This condition probably accounts for more failures in getting a stand of sweet clover than any other cause.

Sowing the seed on top of the ground or on the snow in winter, will often secure a good stand with no cultivation at all. Good results often come from sowing it with small grain in spring, on land that has been cultivated the previous season. Some succeed by sowing after the last cultivation of corn, the seed germinating to some extent the same season, while some does not sprout until the following spring. The ideal condition is to cover the seed from half an inch to an inch with finely pulverized soil, with a firm soil underneath.

### Time of Sowing.

Sweet clover may be sowed in the winter or early spring, as above stated, or at any time from March until August. It should not be seeded when it is likely to start so late that it will not have time to establish itself firmly before winter. Under the different conditions of soil and climate of this great country, it is difficult to give general directions that will apply everywhere.

The time of sowing will depend much upon the manner in which the crop is to be handled. Where it is desired to sow the seed on old meadows or pastures without plowing, it will probably be best to scatter it in winter or early spring. The freezing and thawing have a tendency to soften the hard coat of the seed, as well as to cover it with earth. As a field crop, the writer's limited experience would indicate that spring sowing, with a nurse crop that can be cut early, will be best, though winter seeding on stubble should bring good results.

There is a great diversity of opinion as to the proper amount of seed to sow. Where it is used to thicken up meadows or pastures a smaller amount is needed than where sown as a field crop on newly prepared land. Some growers say that 4 pounds of good unhulled seed per acre is sufficient to sow on grass lands. As high as 20 pounds of hulled seed per acre is advocated by some for a field crop. The seed covering is very hard, and, unless treated, only about half of it will grow the first year. If the seed is scarified, the hard coat is scratched until it germinates readily, and much less seed is necessary to secure a stand than otherwise. Ten pounds of hulled and scarified seed per acre should be sufficient on good land.

It is often difficult to get a stand on old land which is deficient in lime, for lack of the nitrogen-gathering bacteria that thrive on the roots of clovers. It is sometimes necessary to treat a small area with a good coat of manure, and sometimes with crushed lime. After the sweet clover is growing well on this land the area can be gradually extended.

**Utilizing the Crop.**

Probably there is no forage crop which will furnish as much pasture per acre as will sweet clover in its second year of growth. It should be allowed to get a good start in spring before stock is turned in, and the area should be sufficiently large for the animals thus kept. Cattle, hogs and horses all eat it with relish after they become familiar with it, and thrive equally on it. It is a common practice to pasture the crop during the first part of the second season and then to turn the stock off and harvest a seed crop. The writer has harvested a very good crop of seed from a limited area, which was pastured lightly through the entire summer until the crop was cut. Of course, it is not possible to pasture heavily after midsummer, and still secure a good crop of seed.

Sweet clover makes a good quality of hay if cut at the proper time and well cured. If a seed crop is to be cut, the first crop of the second season may be cured for hay by cuttting high enough to leave some of the small branches on the lower part of the stem. If cut too low at this time the plants will die. Sweet clover hay requires more time to cure properly than the clovers with small stems, but if piled in small cocks it is little damaged, even though some rain falls on is. If properly cured it makes a very good winter feed. When cut for hay it should be mown before it begins to bloom to any extent. When it is about two feet high is the right time. The first year it may be cut at almost any time the grower finds convenient.

Some practice sowing sweet clover with early oats, cutting the oats with a high stubble and later getting a crop of hay.

**Saving the Seed.**

The seed crop sometimes fails because the plants are too thick on the ground. They spread or branch widely as they grow, and where they are too thick the blossoms may drop off without setting a full crop of seed. Usually best results are obtained where a first crop is cut for hay or is pastured until mid-summer. The second crop does not grow as high as the first would do if permitted to seed, thus making it easier to handle.

Seed is obtained only the second year, and if the first growth of that year is permitted to seed, the plants will die when cut, so that only the one crop can be obtained.

The seed ripens so iregularly that it is not always easy to tell just when it should be cut in order to save the largest amount of seed. At best, much of it will shatter off and be lost, since the first to ripen will be ready while there is still a large amount of bloom. The most seed will be secured by cutting when about three-fourths of the seed pods have turned brown. If cut sooner there will be too many blossoms and immature seeds; if cut later too much of the ripe seed will shatter in the harvesting. Usually enough seeds shatter off to reseed the land. Some growers have been able to continue the same land in sweet clover for fifteen or twenty years by sowing two years in succession to begin with. After the first year a crop of seed will ripen every year.

It is something of a problem to harvest the seed without losing a large portion of it. The writer has cut a small field with an ordinary mower when the plants were wet with dew, and immediately raked it into windrows. This method is hardly to be advised where the seed is to be hauled to a threshing machine, since more of the seed will be wasted than where it is bound into bundles. This small field was threshed by hand with forks. A large sheet of canvas was laid on the ground and the sweet clover carefully lifted on it, after it was fully dried. By beating with the forks the seed was readily separated from the stalks.

The ordinary grain binder is generally used for this purpose. Where much seed is to be harvested, it is necessary to provide some special pans to catch the seed that shatter off. Corn binders have been used in some cases.

When threshed with a grain separator, the straw is broken up so much that it makes a fair forage for wintering cattle or horses. They will not eat it readily when threshed by hand, since the straw is not broken up to any extent and the dry stalks are too coarse otherwise.

Those interested in this subject will do well to write to the U. S. Department of Agriculture for Farmer's Bulletins which deal with different phases of the culture of sweet clover. They give in much greater detail information that space will not permit here.

### SWEET FENNEL (Foeniculum vulgare).

The cultivated fennel from Europe has become naturalized in some places along the Atlantic Coast in Maryland and Virginia and other Eastern States. It is often cultivated in gardens in many localities. Lovell lists it as the source of a light amber honey.

### SUMAC (RHUS).

There are about one hundred and twenty species of rhus found in Asia, South America and North America. There are fourteen species common to North America. The red or scarlet sumac, shown in Figure 133 **(Rhus glabra)** is most common, being found from New England west to Saskatchewan, Colorado and Arizona, and south to Florida and Louisiana.

This species is a well-known source of nectar and is especially important in New England.

In Texas, Scholl lists the dwarf sumac **(Rhus copallina)** as yielding surplus throughout eastern and south Texas. He also lists green sumac **(Rhus virens)** as attracting the bees in west Texas.

In California, Richter lists poison oak **(Rhus diversiloba)** as yielding a superior grade of white honey which granulates readily. He also reports laurel sumac **(Rhus laurina)** as yielding amber honey of marked odor but fine flavor.

Fig. 133. Leaves and berries of red sumac.

The poison ivy **(Rhus Toxicodendron),** common to the Eastern States from Nova Scotia to Wisconsin and south to Arkansas and Florida, is a vigorous vine, climbing by means of aerial rootlets. The flowers are inconspicuous, but secrete nectar freely. Where sufficiently abundant, sur plus may be expected from this source.

Some species of sumac may be expected in almost every section of the country where woodlands are common. Nearly all species seem to be attractive to the bees, although it is only in limited localities that honey in surplus quantity is reported. The honey is reputed of good quality, with mild flavor. In the east the honeyflow from sumac is sometimes very rapid and a liberal quantity of surplus secured, at times as high as 100 pounds per colony. New honey from this source is somewhat bitter to the taste,

but this characteristic soon disappears. The blooming period usually comes in July and lasts for two or three weeks.

The dwarf sumac is a widely distributed species, known is some localities as mountain sumac. It is common in the Gulf States and is the source of honey in favored localities.

**SUNFLOWER (Helianthus).**

There are many species of the sunflowers, some of which may be found from the Atlantic Coast to California, and from Canada to the Gulf.

Fig. 134. Wild sunflower.

(Fig. 134.) They are tall, coarse weeds, with yellow flowers. Large numbers of insects of many species may be found on the sunflower blossoms in search of the nectar. Whenever these plants are sufficiently abundant they are the source of large quantities of honey. M. H. Mendleson, of Ventura, California, reports that one year, following a wet winter, he secured a carload of surplus honey from sunflowers, although such yields are extremely rare in his locality.

The cultivated sunflowers are of little if any value for honey, but produce seed in large quantity, which is valued as poultry food. The Jerusalem artichoke is a variety of sunflower grown for the tubers. A variety of this plant grows wild in the upper Mississippi Valley States, where it is regarded as a bad weed. It is frequently reported as a good honey plant.

Many of the wild sunflowers are perennials, persisting for many years when once established. They are commonly to be found along wagon roads, railroads and other waste places. The honey is amber in color and strong in flavor.

**SUPPLE JACK, see Rattan Vine.**
**SWEET BAY, see Magnolia.**
**SWAMP LAUREL, see Magnolia.**
**SWEET PEPPERBUSH, see Pepperbush.**
**SYMPHORICARPOS, see Indian Currant.**

# T

**TOCALOTE, see Star Thistle.**
**TANGLEFOOT, see Aster, also Wild Alfalfa.**
**TARAXACUM, see Dandelion.**

**TARWEED (Hemizonia)**

There are about eight species of hemizonia or tarweeds in California. (Fig. 135.) Of these Richter lists three as sources of honey and indicates that others may also be of importance. The tarweed **(Hemizonia fasciculata)** is reported as common over a large part of southern California, except on the desert, and north to San Francisco. The blooming period is given from June to August and the honey is said to be dark amber with strong aroma. He states that it is an excellent producer, especially along the coast from Santa Barbara to San Diego, and that the honey is largely used in the manufacture of chewing tobacco and shoe blacking.

The yellow tarweed **(Hemizonia virgata)** is said to be common in the interior valleys and to be a "heavy and consistent yielder, beginning in August and lasting for about twenty days, according to Mr. B. B. Hogaboom of Elk Grove." The honey is stated to be of light yellow color, good flavor and heavy body.

The coast tarweed **(Hemizonia corymbosa)** is reported as yielding some honey, but not nearly as much as the foregoing species.

In Fresno County tarweed, known as yellow-tops, is stated to bloom from April to June and to yield an occasional surplus. The name vinegar weed is sometimes applied to tarweed in the San Joaquin Valley.—Honey Plants of California.

**TEASEL (Dipsacus fullonum). FULLER'S TEASEL.**

Fuller's teasel is a European plant which was for a time cultivated in this country for the heads of stiff chaff with hooked points, used for raising the nap upon woolen cloth. Although no longer mentioned as a cultivated plant, it has escaped from cultivation and persists as a weed in some places.

Fig. 135. Tarweed blossoms.

During the time when it was generally cultivated in some parts of New York, the late G. M. Doolittle secured more than $1,000 per year from less than 100 colonies, credited with being largely from teasel. (American Bee Journal, July 21, 1886.) The high price of teasel in the market led to a great boom for a few years. A beekeeper writing in the American Bee Journal in 1878 stated that the honey-yielding qualities of teasel were equal to basswood. He described the flavor of the honey as excellent, the color white and transparent. Reports of carloads of teasel honey shipped to Thurber & Co., are referred to and the statement made that it is one of the greatest honey-producing plants in existence.

In the same Journal (Aug. 18, 1886), G. M. Doolittle writes a long article giving the history and cultivation of the plant. From this article the following extracts are taken:

> "Bees work on teasel all hours of the day, and no matter how well basswood may yield honey, a few bees will be found at work on teasel. A bee that works on teasel is readily distinguished from those that work on basswood, by the abdomen being covered with a white dust. Black and hybrid bees work on it in larger proportion than the Italians."

"The honey from teasel is very thin and white, in fact the whitest honey I ever saw; but it is not of as good flavor as either clover or basswood. This thinness of the nectar, and its coming just when bass wood does is the great drawback to it. From careful tests I should say that it would take about four bee-loads of it to be equal to one bee-load of nectar gathered from basswood. Coming as it does with basswood, makes it of no great advantage, except that it usually lasts six to ten days after basswood is gone.

"Again, my bees have to fly two to ten miles to get this nectar, as I am on the southern edge of the teasel belt. According to those who believe bees fly only 1½ to 2 miles for honey, I should not get anything from teasel. I have repeatedly seen my bees flying to and from the teasel fields from our church door, which is 2½ miles from my apiary in line with the fields.

"As to what proportion of my honey has come from teasel the past fifteen years, I should say about one-tenth; some years more and some years not a single pound. In 1877 I got the largest crop, while from 1878 to 1884 little if any was obtained."

**TENDRIL-BEARING SMARTWEED, see Brunnichia.**

**TENNESSEE—Honey Flora of.**

From a special circular sent to the largest beekeepers of the State, asking them to give the names of the chief nectar-producing flowers of their section, the following was gained. The list given below is arranged in order of importance in the estimation of these practical beekeepers:

White clover.
Poplar.
Linden or basswood.
Sourwood.
Aster.
Black locust.
Chestnut.
Goldenrod.
Stickweed.
Red Clover.
Persimmon.
Alsike clover.
Cowpeas
Tanglefoot (aster).
Sumac.
Maple.
Black gum.
Alfalfa.
Melilotus.
Cotton.
Corn.
Wireweed.
Boneset.
Buckbrush.
Huckleberry.
Whortleberry.
Elm.
Yellow-wood.
Daisy fleabane.
Heartsease.
Cane.
Crowfoot moss.
Willows.
Bitterweed.
Turnip.
Dandelion.
Strawberry.
Pea wood.
Cottonwood.
Cedar.
Blackberry.
Catnip.
Fruit berries.
Aspen.
Raspberry.
Oak.
Spanish needle.

—G. M. Bentley, Tennessee Board of Entomology, Bulletin No. 9.

**TEUCRIUM, see Germander.**

**TEXAN EBONY (Siderocarpos flexicaulis).**

Texan ebony is a beautiful shrub or small tree common to the Rio Grande Valley in Texas and abundant in northern Mexico. In the vicinity of Brownsville it is regarded as a valuable source of nectar, blooming two or three times during the year. The tree only blooms two or three days, so the flow is short, usually not exceeding a week, as the difference in blooming time between different trees is not great. The honey is of fine quality and light in color. In some localities beekeepers report that the flow only lasts about two days, but is heavy for this short period. Rains bring it into bloom, and in seasons when rains are frequent, it blooms several times.

Fig. 136. A clump of southwest Texas honey plants: agarita, mesquite, blackberry, brazilwood, anaqua, prickly pear and huisache, all growing together near Goliad.

**TEXAS—Honey Sources of.**

Texas is a very large State, with a great diversity of soil and climatic conditions. In order to appreciate its vast extent, one needs to study the map and note something of the variety of climate represented within her borders. Orange, Texas, is very nearly south of Des Moines, Iowa, while El Paso is further west than Denver, Colorado. The northern line is near to southern Kansas, while Brownsville is a long distance south of San Diego, California. One might describe almost any condition of soil and climate with which he is familiar in any part of the United States and say

with truth that it is like Texas, for almost every condition of soil or climate of the rest of the country is to be found somewhere in Texas. The climate ranges from a winter temperature of 20 degrees below zero in the Panhandle, to an almost frostless condition in the Lower Rio Grande Valley. In east Texas there is a heavy rainfall, with a consequent luxuriant vegetation, while in parts of west Texas one finds a desert flora and little rain. At one point which the author once visited he was told there had been no rain for eighteen months and the very dry and dead condition of everything, even the cactus, indicated that it was true.

Texas seems to be divided into about five natural beekeeping divisions. Each of these has a flora and conditions peculiar to itself, though, of course, there is a gradual merging of these natural divisions. The lower Rio Grande Valley is the southernmost section of the United States, except the extreme tip of Florida. Here we find conditions unlike any other part of Texas. There is a great variety of honey plants, with a light flow almost continuously, but no heavy honey flows. This condition favors the continuous breeding of bees and the consumption of the honey gathered in brood rearing. It is the most favorable situation in America for the rearing of queens and bees, but a poor place for honey production, since the average surplus per colony seldom exceeds twenty-five pounds.

In this section bees swarm as late as December and gather sufficient nectar to carry them through the brief period when vegetation is dormant. The huisache and catsclaw bloom in February and March. Hackberry also begins to yield in February. From February till December there are but short periods without some nectar coming from the field. Brazilwood, horsemint, Texan ebony, blackbrush, privet, coma, mesquite, whitebrush, and many others, yield light flows of nectar.

**The Arid Region**

The escarpment running east and west between San Antonio and New Braunfels marks a very definite boundary to the belt where cotton is the principal source of surplus honey. South of the escarpment and extending to the valley of the Rio Grande, we have the mesquite region. A line drawn in a southeasterly direction from San Antonio, through Cuera and Victoria to the Gulf, would mark the approximate eastern boundary of this region. Figure 136 shows a characteristic group of honey plants of southwest Texas. Agarita (barberry), mesquite, hackberry, Mexican persimmon, brazilwood, anaqua, prickly pear and huisache, all valuable plants to the beekeeper, are growing together. There are very characteristic plants for this region. Most of the honey comes from thorny shrubs, including catsclaw, huajillo (pronounced wa-he-ya), etc. This belt extends westward for a long distance and includes the famous Uvalde County, from which hundreds of cars of fine honey from catsclaw and huajillo have been shipped.

**The Cotton Region.**

North of the escarpment already mentioned we find the cotton belt extending north to Oklahoma and including the black, waxy lands and other heavy soils. Figure 46, in connection with the article on cotton,

shows an outline map roughly indicating the different honey regions of the State. Within this particular area, we find the highest development of agriculture in Texas. The soil is rich and the climate mild. Cotton, corn, alfalfa, small grains and truck crops are all profitably grown. Mesquite is an important source of nectar in the cotton belt, as is also horsemint, and in the northern portion, sweet clover. Broomweed is also important, some seasons.

**East Texas.**

In the timbered regions of east Texas there is some splendid beekeeping territory unoccupied. There is a variety of flora to be equalled in few sections, and remarkable yields of honey are reported. On heavy soils cotton yields freely. Basswood, rattan, huckleberry, partridge pea, horsemint, bitterweed and cowpeas are all reported as sources of surplus honey in this section. Beekeepers of extensive experience report that one can depend upon an average of more than one hundred pounds per colony per year for a ten-year period.

Although the average yield is much higher and the flows are much more dependable than in other parts of Texas, the business of beekeeping is less highly specialized here than in other parts of the State. This is probably due to the fact that general agriculture is profitable and public attention has not been called to the possibilities of this section.

**THIMBLEBERRY, see Raspberry; also Salmon Berry.**
**THORN APPLE, see Hawthorne.**
**THOROUGHWORT, see Boneset.**

**THYME (Thymus).**

Thyme is an introduced plant from Europe which is sometimes cultivated in gardens and occurs occasionally as an escape. There are two species listed in this country **Thymus vulgaris,** the source of the famed honey from Mt. Hymettus, and **Thymus serphyllum,** the wild or creeping thyme.

According to J. E. Crane, thyme is found in southwestern Vermont in sufficient abundance to make excellent pasture for the bees during August. There is an occasional report from some beekeeper who finds the bees much attracted to the plant, but as yet no reports of surplus honey worthy of mention have been received.

**TIEVINE, see Morning Glory.**
**TISSWOOD, see Red Bay.**

**TI-TI.**

The leatherwood or black ti-ti **(Cyrilla racemiflora)** is a shrub with shining leaves and large numbers of small flowers in clusters. It occurs in swamps from southern Virginia to Florida and west to Louisiana and Texas. In Alabama and Mississippi it occurs from the Central Pine Belt to the Coast Plain, in the edges of swamps and along streams. It is also

known as white ti-ti, ironwood and red ti-ti. It sometimes reaches the height of 20 to 30 feet, becoming a small tree, though usually it is found as a shrub. The thin bark breaks up into large scales.

The bloom opens in June and July and is not regarded as a very dependable source of nectar. The honey is dark, with a mild flavor.

The ti-ti **(Cliftonia monophylla),** sometimes called buckwheat-tree or ironwood, also known as black ti-ti, occurs in wet, sandy soil and swamps from South Carolina to Florida and west to Louisiana. It is an attractive tree, often reaching a height of 30 to 40 feet. This shrub or tree, as the case may be, often grows in dense thickets called ti-ti swamps. The flowers are white and fragrant and appear in late February to April. There are large areas of ti-ti swamp in Georgia, Alabama and Mississippi, which furnish abundant bee pasture. According to Baldwin, it yields surplus honey in the extreme northwest portion of west Florida. He describes the honey as red, strong, and suitable mostly for baking purposes. (Gleanings, March 15, 1911.)

Ti-ti is of more or less value as a source of nectar in the swampy districts of all the Southeastern States from South Carolina to Louisiana. The honey is not of the best quality, nor is the yield generally heavy.

**TOBACCO (Nicotiana tabacum).**

The tobacco plant is a coarse annual. It is grown as a field crop in the South and also in a few northern localities, especially in Wisconsin and Connecticut. As a honey plant it is probably seldom important. The fact that the plants are usually cut in advance of the time when the bloom is at its best, would make it unavailable, for the most part, as a source of nectar.

> "We are in a location where hundreds of acres of tobacco are raised every year. I have taken bees and placed them near the fields and they will store some honey from the plant some years. It is very dark, much like buckwheat in color, strong and very heavy body. Buckwheat is not my favorite honey, but I can eat it. Tobacco honey I cannot. It is very slow to granulate, and I have never seen it harden as other honey will, even when well ripened and two years old."—W. K. Rockwell, Bloomfield, Conn. American Bee Journal, page 63, 1919.
>
> "Tobacco yields a heavy flow under certain conditions in Porto Rico."—Henry Brenner, in American Bee Journal, page 381. 1916.
>
> "Tobacco in this section has always been raised in the open field and, when about 4 feet high, each plant has been 'topped' and not allowed to go to seed. * * * It is now being picked in the field instead of being cut by the old method. The plant is allowed to grow from 7 to 10 feet high and goes to seed. The leaves are saved by picking, this work commencing at the bottom, one row of leaves being gathered at a time, and the top leaves picked last. The plants are thus allowed to blossom, each one bearing hundreds of flowers, and they continue to bloom from August 1 till frost. Thus we have thrown open to our bees hundreds of acres of tobacco, containing myriads of flowers.. The bees swarm on it, some days more than others, and the honey comes in as fast as during the earlier flows."—E. H. Shattuck, Granby, Conn. Gleanings, page 268. 1911.

**TOLLON BERRY,** **see Christmas Berry.**

**TOOTHACHE-TREE, see Prickly Ash.**
**TOY-ON BERRY, see Christmas Berry.**
**TRAILING ARBUTUS, see Arbutus.**
**TREE HUCKLEBERRY, see Farkle-Berry.**
**TREE OF HEAVEN, see Varnish Tree.**

**TREE CLOVER, TREE ALFALFA or TAGASASTE (Cytisus proliferus alba).**

The tree alfalfa, or white broom, is grown to some extent in California. In Australia it is regarded as important, as the following extract from Rayment (Money in Bees in Australasia), will show:

> "This rapid-growing hedge plant is now widely known as a grand honey yielder. As a wind break for the apiary it is unrivaled. The white blossoms burst the sheaves early in spring, almost before the winter has departed. Bees work upon it during a shower, as the drooping habit of the flowers prevents the nectar washing out with the rain. The pollen is cadmium in color and the honey very pale and clear, rather thin and of mild flavor. To make a close hedge it should be severely cut back. Unfortunately, the sheep and cattle, also the kangaroos are fond of it and keep it eaten back."

It is native to the Canary Islands and adjacent regions. As it thrives in California, it is promising for trial in the warmer parts of America.

**TRILLIUM.**

One of the first spring flowers, the trillium, of which there are several species, is attractive to the bees. It is commonly known by the name of wake robin, or birthroot. As it blooms so early, it is seldom that the bees find many good days for flying, and such early spring flowers can never be regarded as important except for the purpose of stimulating brood rearing.

**TROPICAL LILAC (Duranta plumiere). GOLDEN DEWDROP.**

The tropical lilac is a hedge plant cultivated in Florida and California and other southern localities. W. K. Morrison lists it in Gleanings (Aug. 1, 1905), as extremely attractive to the bees and as blooming for some time. Probably not sufficiently abundant in America to be important anywhere.

**TRUMPET WEED, see Boneset.**

**TULIP-POPLAR or TULIP TREE (Liriodendron tulipifera).**

The tulip-tree, also known as yellow poplar, is a very large tree, often growing to a height of 100 to 140 feet, and a diameter of 6 to 9 feet. It is found from southern New England west to southern Michigan and south to the Gulf States, east of the Mississippi. It is also found to a limited extent in southeastern Missouri and eastern Arkansas. It blooms in April and May and produces a light amber honey of good flavor.

According to Buchanan, the honey yield from this source is heavy and the tree is an important addition to the nectar-secreting flora of Tennessee and nearby States. The showy flowers are shown at Figure 137.

The possibilities of this source of nectar are not properly appreciated.

Since it blooms so early in spring, few colonies of bees are sufficiently strong to gather the crop possible from tulip-poplar. The skilled bee-keeper, who can bring his colonies through the winter in good condition, gets large yields of honey from this source. In the vicinity of Washing-

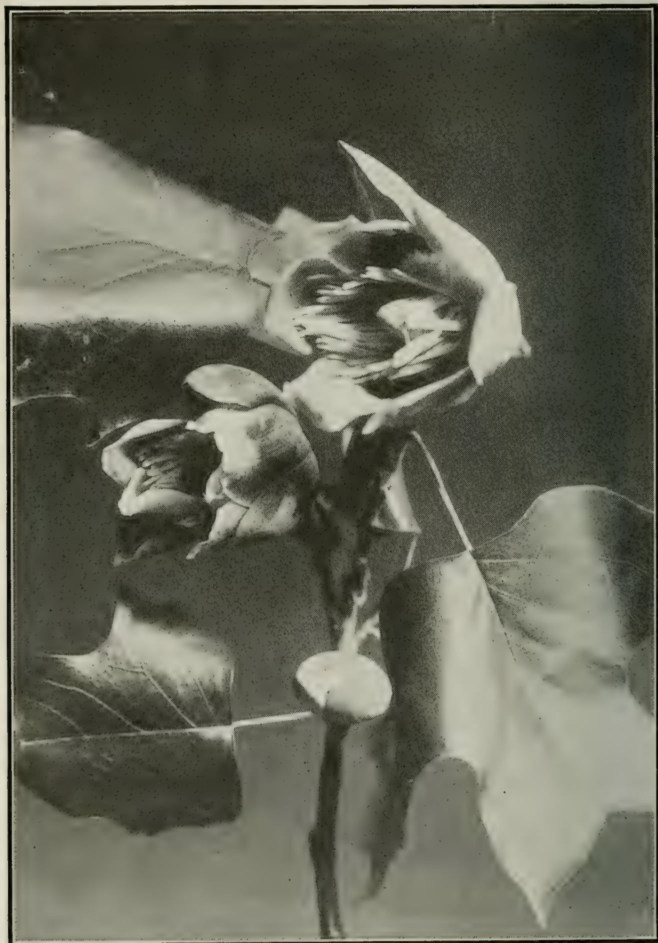


Fig. 137. Blossoms of tulip-poplar.

ton, D. C., it is the principal source of surplus, and strong colonies often store an average of 100 pounds. In many cases the bees build up on tulip-poplar only to become strong after the flow is over. In locations where this tree is common, too much care cannot be taken to get strong colonies early in spring to take advantage of this flow.

**TUPELO-GUM (Nyssa).**

There are four species of the tupelo-gum trees, which should not be confused with the gums of the Pacific Coast, which are eucalyptus (See Eucalyptus). The tupelo-gum, or cotton-gum **(Nyssa aquatica)** (Fig. 138), is a very large tree common to the swamps from southeastern Missouri and southern Illinois east to Virginia and south to Florida and Texas. It grows to a height of more than 100 feet and yields enormous quantities of nectar.

The pepperidge, or highland black-gum **(Nyssa sylvatica)** sometimes called sour-gum, yellow-gum, tupelo, or stinkwood, grows in moist upland woods from Ontario and New England to Michigan and south to Florida and Texas. It reaches a height of 150 feet and a diameter of four feet, under favorable conditions.

The water-gum, or Southern black-gum **(Nyssa biflora),** also called water tupelo, has a swollen base and, when growing in the water, produces erect roots which rise to the surface. It is found from North Carolina to Florida and west to eastern Texas. It is sometimes regarded as a variety of the pepperidge or black-gum.

The ogeche plum or wild lime-tree **(Nyssa Ogeche),** called white tupelo, is much smaller than the other gum-trees, growing to a height of forty to sixty feet. It is common to the swamps of Georgia, Florida and South Carolina.

The first named species is very common in the swamps of Alabama and Florida, where it often grows with the bald cypress on the banks of the Alabama, Tombigbee and Appalachicola Rivers. A. B. Marchant averaged 82 pounds of surplus honey per colony from tupelo for a seventeen-year period on the Appalachicola River in Florida. During part of this time he kept as many as 500 colonies to the yard. In 1904, he took 250 thirty-gallon barrels from 750 colonies, an average of about 120 pounds per colony.

The tupelos are the source of much honey in Arkansas, east Texas and other Southern States, as well as in Alabama and Florida. Beekeepers complain that in many of the best tupelo locations there is a shortage of summer pollen, so that it becomes necessary to move the bees away when the tupelo flow is over.

The tupelo honey is of good quality, and, when unmixed, will not granulate. Bottlers like to use tupelo honey for blending with other grades to retard granulation. It is good body and mild flavor, and finds a ready sale at better prices than most southern honey brings.

**TURKEY MULLEIN (Eremocarpus setigerus).**

The turkey mullein is also known as coyote weed, wooly white drought weed, and yerba del pescado. The latter, according to Jepson, is the Spa-

nish-Californian name, derived from the custom of the Indians to use the heavy-scented herbage of this plant to stupefy fish in small streams, to catch them by hand. He gives the range as dry open areas from the plains or the Sacramento and San Joaquin, Sierra Nevada foothills to the low

Fig. 138. Blossoms of the tupelo gum.

hills and valley fields of the Coast Ranges. It grows mostly in stubble fields following the grain harvests, contesting for survival with the blue curls..

From Western Honeybee we quote as follows:

> "Turkey mullein is a different appearing plant (from blue curls), but grows under exactly similar conditions. Its insignificant pale green or white flowers yield a thick amber honey, of biting, astringent flavor, often in considerable quantities.
>
> "I have known a beekeeper in San Diego County to market eight tons of this honey. It is fit only for manufacturing purposes. The foliage of turkey mullein is white, wooly, and exhales a pungent odor." October. 1914.

**TURNIP (Brassica).**

Where turnips are grown for seed in large acreage, surplus honey may be expected from this source. The late J. S. Harbison said of them:

> "Turnip blossoms are eagerly sought by the bees, and afford so rich pasturage during March and April as to make it a profitable crop, if but for this purpose alone."—Beekeeper's Directory.

**TURPENTINE WEED, see Blue Curls.**

# U

**ULEX, see Gorse.**
**UMBRELLA TREE, see Wild China.**

**UTAH—Honey Sources of.**

Most of the surplus honey which goes to market from Utah is from sweet clover and alfalfa. Salmon-berry, clover, dandelion, willows and the desert flowers add something to the output of the apiary.

# V

**VACCINIUM, see Blueberry.**

**VARNISH TREE or TREE OF HEAVEN (Ailanthus glandulosa).**

This tree is met by a great variety of names, varnish tree, tree of heaven and Chinese sumac being common. The tree is a native of China and has been extensively cultivated as a shade tree in America. It spreads easily and is quite generally naturalized. Scholl lists it as a source of honey and pollen in Texas. Richter regards it as a wonderful yielder in California, where it produces an abundance of ill-tasting honey. It is reported as a honey producer in Georgia and is to be found in many States from east to west in greater or less abundance. The disagreeable odor

of the staminate flowers is a well-known characteristic of the tree. In appearance it looks much like a very large sumac.

In the vicinity of Paris, France, the ailanthus, also called ailanthe, yields honey which must be removed before other honeys are harvested. as it spoils the taste of the honey of other plants.

**VERBENA, see Vervain.**

**VERMONT—Honey Sources of.**

The willows furnish first nectar in Vermont. Fruit blossoms, dandelions and maples also furnish nectar in abundance in early spring. White and alsike clover, together with goldenrod, furnish the principal surplus honey. Sumac, laurel, asters and less important plants also furnish some honey.

**VERNONIA, see Ironweed.**

Fig. 139. Bloom of the purple vervain.

**VERVAIN (Verbena).**

There are about 16 species of verbenas in North America, and several of them are widely distributed. Figure 139 shows the blue vervain **(Ver-**

**bena hastata),** which is found from Nova Scotia to Quebec and Manitoba, south to Arkansas, New Mexico and California, and on the east, south to Georgia. This particular species is usually found in low lands, along streams, etc. Richter, in his "Honey Plants of California," mentions another species, **Verbena prostrata,** as yielding considerable honey in some localities in that State. In Iowa the hoary vervain **(Verbena stricta),** is very common in upland pastures, especially over the north half of the State, and reports of surplus honey from this source are not uncommon.

Mr. Scholl reports **Verbena xutha** as yielding sparingly in Texas. While in the main the vervains can hardly be regarded as important honey plants, in limited localities some species are very valuable sources of nectar. Mr. S. W. Snyder, former Secretary of the Iowa Beekeepers' Assosiation, reports the blue vervain as quite valuable in his locality, some years furnishing a surplus.

**VERVENIA, see Phacelia.**

Fig. 140. Virginia creeper, or American ivy.

**VETCH (Vicia).**

There are about a dozen species of vetch native to America and two or three varieties widely cultivated for forage. They yield some honey, and there are reports from beekeepers to the effect that their bees work upon vetch freely. However, ther is little to indicate that they are an important source of nectar. Richter lists spring vetch as a source of honey,

but does not indicate that it yields surplus in California, where it is grown as a cover crop. Some species have extra-floral nectaries.

Some of the group are regarded as good honey plants in Europe.

**VINEGAR-WEED, see Blue Curls, also Tarweed**

**VINE MAPLE (Acer circinatum).**

Vine maple is common on the Pacific Coast from Humboldt County, California, north to Washington. There are numerous reports of vine maple as an abundant source of early nectar in Oregon and Washington. The honey is amber and of excellent quality, but it blooms so early (April) that the bees are usually not in condition to store much surplus. (See Maple). In exceptional seasons as high as 50 pounds of surplus have been gathered by a single colony from vine maple.

Fig. 141. Blossoms and leaf of Virginia waterleaf.

**VINE MILKWEED (Enslenia albida).**

The vine milkweed is a smooth perennial climbing herb, with small whitish flowers. It is common along streams from southern Pennsylvania and the Ohio Valley south to north Georgia and west to Texas.

It is reported as a good honey plant in the vicinity of Buffalo, Texas. H. B. Parks states that it is a valuable bee plant, if sufficiently common.

**VIPER'S BUGLOSS, see Blueweed.**

**VIRGINIA—Honey Sources of.**

Willows, fruit blossoms, red-bud and maples furnish early nectar and

pollen. These are followed by dandelion, which is abundant. Persimmon, clover, locust, chinquapin, tulip-poplar, holly, laurel, basswood, tupelo and asters are sources of later nectar. Sourwood is found in some sections and produces an abundance of the finest honey.

**VIRGIN'S BOWER,** **see Clematis.**

Fig. 142. Masses of Virginia Waterleaf in the author's wild garden at Atlantic Iowa.

**VIRGINIA CREEPER (Parthenocissus quinquefolia).**

The Virginia creeper, also known as American ivy or woodbine, is a common climbing vine in thickets and woods from New England to Quebec and Manitoba, Dakota and Colorado and south to the Gulf from Florida to western Texas.

While the bees seek it eagerly at times and the vines fairly hum with them, it can hardly be regarded as of importance to the beekeeper.

This plant is often confused with poison ivy, but the two plants can easily be distinguished by the difference in habit of growth, and by the five leaflets in the creeper, as shown in Figure 140, while the poison ivy has only three leaflets to each leaf.

**VIRGINIA WATERLEAF (Hydrophyllum virginicum).**

The Virginia waterleaf does not bloom until after the fruit blossoms are gone, and so has less competition for attention than some other plants that come into bloom during the same period. It blooms abundantly and

grows luxuriantly in moist woods. The bees have been so eager for the blossoms of this plant in the writer's wild garden and in the surrounding woods for several years past, that he has come to regard it is quite a valuable honey plant, although nowhere so listed as far as can be learned. Figure 141 shows the blossom and leaf of this plant, while Figure 142 shows masses of the plants in bloom. Apiaries in the vicinity of woodlands should find this plant of considerable value, judging from the writer's limited observation.

### VITEX NEGUNDO INCISA.

A plant of recent introduction by the Bureau of Plant Industry. Described as follows by Frank N. Meyer, explorer, who found it at Shantung, China:

> "A sage which may prove to be a good plant for the arid Southwestern States. It is able to resist alkali remarkably well. The Chinese use it for basketry manufacture, taking the annual shoots for this purpose. It has pretty blue flowers and is diligently visited by all kinds of bees, and as such it might be grown in gardens as a semi-ornamental shrub. It grows, when left alone, up to 20 feet tall."

Specimens tested by the author in Iowa, which were mere whips about 20 inches tall, began bloooming the same season, the last week in July, and had not entirely faded on September 10. The bees sought it eagerly and apparently, if abundant, it would be a valuable honey plant.

# W

**WA-HE-YA (Huajillo), see Acacia.**
**WAHOO, see Hop-Tree.**
**WAKEROBIN, see Trillium.**

### WALNUT (Juglans).

The black walnut is a well-known forest tree in the eastern United States. Its usual range is from Ontario and New England west to Nebraska, and south to Florida and Texas. The wood is very valuable for the manufacture of gunstocks, furniture, etc., and is becoming somewhat scarce. The tree leaves out later than most forest trees, not developing its foliage until May or June. Figure 143 shows the pollen-bearing blossoms. These blossoms are long catkins borne on the wood of the preceding year. The blossoms appear before the leaves. Quantities of pollen are produced, and, at times, the bees seek the trees in such numbers as to make a continuous roar. The walnut blooms after the maples and willows, and is not as valuable as earlier blooming trees, because it comes at about the same time that the dandelions are in bloom. May is the month of blossoming in most northern localities.

The white walnuts or butternuts of the Eastern States, and the English walnuts, Japaneses walnuts and California walnuts grown in the warmer parts of the country, especially in California, are relatives of the black walnut, and probably equally valuable for pollen.

**WASHINGTON—Honey Sources of.**

Alfalfa, sweet clover. Sweet clover is quite generally distributed over all irrigated alfalfa districts. The Yakima Valley is the largest of these districts and supports at least 25,000 colonies. If it were not for spray poison this district could support 50 per cent more. Sweet clover is being introduced in many other sections of the State, Spokane County, for example. New irrigation projects will increase the beekeeping area considerably in many sections of the arid portion of this State.

Fireweed **(Epilobium angustifolium).** This plant is second only to the above as a honey plant. It is found in great abundance on all burned-over land west of the Cascade Mountains. It is also found in more or less abundance on burned sections on the east side. Due to the fact that there is much less rainfall it is not as reliable as a source of nectar as it is on the west side of the State.

White clover is important on old cleared off land on west side. Also

Fig. 143. Pollen-bearing bloom of black walnut.

important in Stevens, Pend 'Oreille, Klickitat, Spokane and Whitman Counties. Of minor importance in most other counties.

Alsike clover. Important in a few localities on the west side and in the northeast part of the State, where conditions are favorable.

Vine maple **(A. circinatum).** Very abundant on the west coast from about King County south. A good yielder of an excellent amber honey. Blooms so early, about April, that few colonies are in a condition to store much surplus.

Oregon maple **(A. macrophyllum).** An important honey plant on the

west side, from about King County south.

Dwarf maple **(A. glabrum).** In most timbered sections of the State. Honey value unknown.

Willow. Willows are abundant in almost every locality and are of great value for spring feeding.

Chittam **(Cascara sagrada).** Abundant in most sections of the west side and reported to be an important honey plant. It is being killed off in many sections, due to the harvesting of the bark for medicinal use.

Locust. Locust has been planted extensively in many of the irrigated sections of the State, where it furnishes an abundance of nectar at a time when it is badly needed by the bees. A surplus is gathered in many sections of Walla Walla County. A water-white honey of excellent flavor.

Dandelion. Abundant in all sections where there is sufficient moisture. As in most sections of the country, it is of great importance.

Cat's ear **(Hypochaeris radicata).** Sometimes called California dandelion. Abundant west of Cascades. Supplies considerable nectar of amber color. In many sections it darkens the fireweed honey, and for that reason beekeepers like to avoid it, if possible.

Goldenrod. Abundant in all sections of the State where there is sufficient moisture. There are a number of species, but the writer has never seen a bee working on it in this State. This is due, in most cases, doubtless, to the fact that more desirable nectar is available.

Gum-weeds **(Grindelia).** Present in most parts of the State. Doubtless of some value.

Mustard. Important on west side in some localities.

Snowberry **(Symphoricarpos racemosus)** and other species. Also called buck-brush, wax berry, wolf berry. Abundant on the west side and in the northeast part of the State. Common in many parts. Seems to yield well where abundant. Quality of honey unknown.

Milkweed **(Asclepias).** Two species are found on the east side. Neither has been seen on the west side, and is not reported as occurring there by Piper and Beattie.

Dewberry **(Rubus macropetalus).** Abundant in logged-off sections. Of considerable importance as a honey plant.

Alder **(A. oregona and A. sinuata).** Common on the west side in particular, especially the former.

Madrona **(Arbutus menziesii).** Common all over the west side, except in heavy timber. Supplies nectar, but importance unknown.

Helianthus. Two species occur. A small, early species, not determined; has been reported as important on the east side, where it grows with little moisture. The species is doubtless **H. annuus,** which is the only one listed by Piper and Beattie. The other species is doubtless an introduced species from the east.

Indian hemp **(Apocynum pemilum).** Northeastern Washington. Important minor plant.

Phacelia **(P. heterophylla)** was found abundant in Kittitas County, where it was yielding considerable nectar. Reported that the honey is amber. **P. tanacetifolia** has been introduced into northern Idaho at Coeur

d'Alene in a very limited way, where it yields considerable nectar, considering its abundance.

Horehound and catnip. Both plants are found in considerable abundance in all parts of the State where there is sufficient moisture. Both seem to yield considerable nectar.

Huckleberry. Several species of huckleberries are found in the State and are very abundant in many sections, as, for example, Mason County. They have been reported as honey plants, but their relative value is unknown.—H. A. Scullen.

**WATER-GUM, see Tupelo.**

**WATERMELON (Citrullus citrullus).**

Where grown on a commercial scale the watermelon is the source of some honey. The bees visit the blossoms eagerly for both pollen and nectar. Important only in a few localities.

**WATER PEPPER, see Heartsease.**

**WATERWEED (Jussiaea californica).**

The California waterweed is common to wet lands in the lower Sacramento and San Joaquin Valleys, where, according to Richter, it is the source of considerable ill-tasting honey.

**WATTLE, see Acacia.**
**WAXBERRY, see Snowberry.**

**WEATHER AND HONEY PRODUCTION.**

It is a well-known fact that nectar secretion is very sensitive to weather conditions. However, the same conditions are not most favorable for all plants.

J. L. Strong, a beekeeper of Clarinda, Iowa, kept a careful record of weather conditions in connection with the daily gain or loss of a colony on scales for 29 years, from 1885 to 1914. In his locality, in southwestern Iowa, white clover is the principal source of honey. While the bees begin the season with the willows, maples, fruit bloom and dandelion, there is little surplus stored until the blooming of clover. Leslie A. Kenoyer, of the Iowa College of Agriculture, made a careful study of the Strong records and prepared a bulletin outlining his conclusions. While the records kept by Mr. Strong for a long period give material for fairly accurate conclusions regarding the effect of the weather on nectar secretion in white clover, it can hardly be expected that the same conclusions will apply to all other plants. (Bulletin 169, Agricultural Experiment Station, Ames, Iowa.) From the foregoing the following conclusions are extracted:

**Rain.**

Abundant rain seems essential to stimulate plants to the vigor necessary to nectar production and to furnish the water contained in the secretion.

Some honey years are poor because of excessive rain. In June, 1902, there was 11.64 inches of rainfall. June, 1911 represents the opposite extreme, with .76 inch, and was also poor. Abundant rain in advance of the honeyflow is of great importance, particularly in the month of May. When there is 5 inches or more of rain in May an abundant honey harvest seldom fails.

It is also shown that a heavy fall of snow during the previous winter tends to favor a good yield of honey. The abundance of snow provides both available moisture and protection to the clover plants during the cold months.

A rainy day is, of course, unequal to a clear one for honey production, and the fact is shown that best yields are gathered on the days just preceding and following the rains. A gradual increase in honey stored is apparent each day following a rain, until the fourth day, when it begins gradually to decline.

### Wind.

An average of results for 200 days shows that south winds are slightly more favorable, probably due to the warmer and clearer weather. East winds are shown to be somewhat unfavorable, probably due to the clouds and rains which frequently accompany them. (This does not apply everywhere.)

### Temperature.

It is generally recognized among beekeepers that hot weather is most favorable for nectar secretion. The above records show that the hot months do yield better than the cooler ones, this being especially noticeable in the months of May and September, which are often too cool in Iowa for best production. It was found that little honey was stored at a temperature below 70 degrees and that 90 per cent of the entire amount gathered was at temperatures between 80 and 100 degrees. Days attaining a maximum between 80 and 90 degrees are the best yielding days, being slightly better than those with higher temperaturees. A variation in the temperature seems to favor nectar secretion. Mr. Kenoyer was able to show experimentally that low temperatures favor the accumulation of nectar. Days, then, with a wide range of temperature favored the bees.

A cold winter previous to the honeyflow cannot be said to be beneficial, yet it is shown that it is not detrimental. A warm March, however, often favors a good season. This is explained as due to the favorable conditions for building up the colonies of bees in spring as well as to the increased vigor of the clover plants through lack of severe weather at the start of the growing season.

### Kenoyer's Conclusions.

"Mr. Kenoyer concludes that, 1, June yields 56 per cent of the annual hive increase in honey, with about half the remainder gathered in July. 2. A large June increase indicates a good year. 3. There is an evident alternation between good and poor years. 4. A good year has a rainfall slightly above the average, the honey season being pre-

ceded by an autumn, winter and spring with more than the average precipitation. 5. A rainy May scarcely fails to precede a good honey season. 6. South wind seems favorable and east wind unfavorable. 7. The yield shows a gradual depression preceding and a gradual increase until about the fourth day following a rainy day, after which it remains fairly constant until about the fourteenth day following a rain. 8. Good honey months average slightly higher in temperature than poor, this being especially true of the spring and fall months. 9. Clear days are favorable to the production of honey. 10. Yield is best on days having a maximum temperature of 80 to 90 degrees. 11. A wide daily range of temperature is favorable for a good yield. 12. A low barometer is favorable for a good yield. 13. The fluctuations in the yield for a producing period seem to be closely correlated to the temperature range and the barometric pressure, acting jointly. 14. A cold winter has no detrimental effect on the yield of the succeeding season, but a cold March reduces it. 15. A winter of heavy snowfall is, in the great majority of cases, followed by a larger honey yield.

**WEST VIRGINIA—Honey Sources of.**

Willows, pollen and some nectar.

Red maple, pollen and some nectar.

Arbutus, slight value.

Peach, important for nectar.

Cherry, important for nectar and pollen.

Redbud (Judas tree), contributing nectar and pollen.

June berry, slight value.

Hawthorn, or haw, pollen and nectar.

Apple, occasional surplus.

Dandelion, valuable pollen and nectar.

Azalea (pink), some nectar and pollen.

Huckleberry, nectar and pollen.

Tupelo, pepperidge, sour or black gum, valuable source of nectar, yields surplus.

Wild raspberry, valuable for surplus.

Tulip-tree or poplar, extremely valuable as a surplus plant.

Black locust, important surplus plant.

Sumac, yields nectar abundantly.

Strawberry, important in nectar.

Alsike clover, very valuable to beekeepers, increasing in popularity.

Holly, important source of pollen.

White clover, chief surplus in certain sections.

Chestnut, some nectar and pollen.

Chinquapin, yields, but of poor flavor.

Basswood or linn, heavy yielder of excellent surplus.

Sourwood, very important, yields extra abundant.

Swamp milkweed, surplus in some localities.

Sweet clover, dependent for surplus.

Blue devil, or viper's bugloss, important.

Buckwheat, excellent yielder in certain years.

Goldenrod, contributory.

Asters, yield surplus.

Willowherb, yields surplus in abundance.
—Chas. A. Reece, Bulletin No. 33, W. Virginia Department of Agriculture.

**WHITE ALDER, see Pepperbush.**

**WHITE BRUSH (Lippia ligustrina).**

White brush is a very common shrub throughout south Texas. It has some resemblance to the Indian currant of the Northern States, except that it is larger in size. It has long sprays of fragrant white flowers which appear several times during the year, following rains. According to H. B. Parks, it yields little honey during the regular blooming period of spring, but during the rain-induced bloom, in late fall, it yields heavily.

In the lower Rio Grande Valley, beekeepers reported to the author that the blooming period is short, but that it usually yields well, while the bloom lasts. In many localities similar reports are received. Most beekeepers regard the honey as of good quality, but the plant not dependable. In seasons when there are frequent heavy rains considerable honey is harvested, as it blooms after every heavy rain.

Fig. 144. Blossom and leaf of white clover

**WHITE CLOVER (Trifolium repens).**

White clover undoubtedly holds first place as a honey plant in America. It is important as a source of nectar from Maine to Nebraska and south to Kentucky and Missouri. In all the Northeastern States it is one of the principal sources of nectar and, in many localities, it stands alone as the source of marketable surplus. Remove white clover, and bee-beekeeping would be a poor dependence in a large portion of this great area. Alsike is similar in yield and quality of its honey, but it is not so widely spread. The white clover plant is a perennial and establishes itself

in pastures, along roadsides and in waste places everywhere. It is a good lawn plant and holds its own with bluegrass in a way that few plants will do.

It yields more heavily in the northern part of its range. One Minesota beekeeper reports that a yield of less than 200 pounds per colony from white clover is uncommon. The author kept bees in southern Iowa for many years, and it was a rare season when the yield in that locality totaled 200 pounds per colony. In northern Iowa the average yield is much better than in the southern part of the State.

Best yields come in seasons following a year of excessive rainfall. In wet years the conditions favor the rooting of thousands of new plants, which are ready to produce a crop of nectar the following summer. Most readers of beekeeping literature are familiar with Dr. C. C. Miller's phenomenal crop harvested in 1913. From 72 colonies of bees he harvested more than 19,000 finished sections of honey, or more than an average of 266 sections per colony. His best colony produced 402 sections of white clover honey. The crop was due to a favorable season, combined with expert management. The flow was unusually long, lasting from early June to late August.

White clover yields best when the weather is hot, with plenty of moisture in the soil.

Honey from white clover is of the best quality. It is mild in flavor, light in color and commands the highest prices in most markets. It is the one honey of high quality produced in sufficient quantity to fill a distinct demand for long periods of time.

Most people prefer white clover honey to the somewhat more spicy flavors of alfalfa or sweet clover, though in color they are similar. Alfalfa grown in southern California is of a different color and flavor from that grown in the Mountain States of Idaho, Utah, Colorado, etc.

**WHITE IRON BARK, see Eucalyptus.**
**WHITE SNAKE-ROOT, see Boneset.**
**WHITEWOOD, see Basswood, also Tulip-Poplar.**

**WILD ALFALFA or DEER CLOVER (Lotus glaber).**

Wild alfalfa is also known as wild broom, deerweed and tanglefoot. In California it is regarded as an important source of honey over a large part of the State. It is a plant growing two to three feet high, with a woody stem at the base. The flowers are yellow, later turning red. Some years the plant is very abundant, then it dies out for a time, so that it varies greatly from year to year. The blooming season is from June to September.

We quote Richter as follows:

"'A very erratic honey producer. Some years, in some sections, yielding twice as much as the sages; this is true for either the coast or the valley side of the coast ranges, yet a good wild alfalfa flow on the east coast does not necessarily mean such is the case on the west side. Beekeepers report wild alfalfa honey as being white, light amber and at times with a characteristic greenish tinge. This is one

of the main honey plants of the Coalinga district. This plant, according to Mr. Z. Quincy, of Ramona, upon reaching its second year of growth, after a mountain fire, is said to give us a great amount of nectar."

**WILD BALSAM APPLE, see Wild Cucumber.**
**WILD BERGAMOT, see Horsemint.**
**WILD BUCKWHEAT, see Erigonum, also Bindweed.**

**WILD CHERRY (Prunus serotina).**

The wild cherries are widely distributed over the North American Continent, and beekeepers who live in timbered sections may expect to find one or more species within reach. The photograph shown herewith, Figure 145, is of the wild black cherry, which is a large tree with reddish-brown branches and oblong taper-pointed leaves. This tree is common in the woods of Newfoundland, Ontario and Manitoba, south to Florida and Arizona. There is a smaller tree with very similar flowers, the choke cherry **(P. virginiana)** to be found over much the same territory, while the western choke cherry, or western wild cherry **(P. demissa),** ranges from Dakota, Kansas and New Mexico west to California and British Columbia.

Fig. 145. Blossoms and leaves of wild cherry.

The larger tree **P. serotina,** is also said to occur in Mexico, Peru and Columbia. There is also a varietal form known as the mountain black

cherry, found in southwestern Virginia, Georgia and Alabama. It is found on the open rocky summits of the higher altitudes. This form is a tree 25 to 35 feet high, with very rough bark and drooping branches. The wild red cherry, or pigeon cherry **(P. pennsylvanica)** is common in the Northwestern States, and secretes nectar freely.

Both leaves and seeds of all these forms are poisonous, although the fruit is edible. There seem to be well authenticated cases of poisoning of cattle from eating the leaves, and of children dying from swallowing the seeds. Pammel, in his book of poisonous plants, gives an extended description of the chemical action in such cases. The poisonous property of all species of cherry leaves, according to authorities quoted there, is due to prussic acid. The poison does not exist as such in the growing plant, but by the action of moisture and a vegetable ferment which exist in the plant, a complicated chemical reaction takes place when the leaves are separated from the stem. Wild cherry bark is used to some extent in medicine.

Wild cherries are not often reported as valuable sources of nectar. Richter lists the western choke cherry as a source of honey in California, and Lovell mentions the wild red cherry in the Eastern States. The writer has a sample of wild cherry honey sent to him from the apiary of W. S. Pangburn, of Jones County, Iowa, having a distinct cherry taste and bright yellow color. After two years it shows no trace of granulation, although subject to all changes of temperature of Iowa climate, both summer and winter. All but few of the samples of honey in the collection have candied under similar conditions.

Since in the Northern States it blooms after the domestic fruits and just before the opening of white clover, it should prove of considerable value where present in quantity.

**WILD CHINA (Sapindus drummondi). See also CHINA TREE.**

The wild China tree, also known as chinaberry, soapberry, or umbrella tree, is a common shade tree in the Southeastern States. It is also found in the Southwestern States to some extent. In Alabama it is a conspicuous feature of the grounds about the homes of rich and poor alike, quantities of the amber colored berries hanging after the leaves have fallen. It is cultivated to a less extent in Texas and California as an ornamental. It also occurs commonly in New Mexico and Arizona. The Spanish name for this tree is "jaboncillo."

It is frequently mentioned as a honey plant in the Southern States, but is probably not sufficiently common in many places to be important. It is sometimes confused with the China tree **(Melia azedarach),** which **see.**

**WILD CRAB APPLE, see Crab Apple.**

**WILD CUCUMBER (Echinocystis lobata).**

The wild cucumber, or wild balsam apple (Fig. 146) is a climbing vine common along streams from New England to Texas. It is also commonly cultivated as a shade for arbors and porches. The plant is an annual and

comes from the seed each year. There are few localities where it is sufficiently abundant to be of value to the beekeeper, and it is seldom mentioned among honey plants. However, in a few localities along the Mississippi River it is reported as quite an important source of nectar in mid-summer. On river bottoms it is sometimes to be found in great abundance. The honey is reputed to be white and of good flavor.

Fig. 146. Blossom, fruit and leaf of wild cucumber.

**WILD CURRANT, see Currant, also Barberry.**

**WILD HOLLYHOCK (Sidalcea malvaeflora). CHECKER-BLOOM.**

The wild hollyhock is common in the valleys and plains of California, where it is of some importance as a honey plant. It is reported as of special importance in the Imperial Valley. Related species occur in New Mexico and north to Utah.

**WILD LIME-TREE, see Tupelo.**

**WILD OLIVE, see Oleaster.**

**WILD PARSNIP (Pastinaca sativa).**

The wild parsnip, introduced from Europe, has spread over a wide area

Fig. 147. Wild parsnip.

from the Atlantic to the Pacific coast. (Fig. 147). It is common along railroads and highways everywhere. The small yellow flowers, which are borne in clusters like an open umbrella, are attractive to a large variety of insects. The nectar, apparently, is never very abundant, hence it is not an important source of honey, although the plant is sometimes very plentiful. (See Parsnip).

**WILD PENNYROYAL (Satureja rigidi).**

Wild pennyroyal (Fig. 148) is a square-stemmed plant of the mint family that grows abundantly on the sandy pine lands of the south half of Florida. It begins blooming in December in the southern part of its range, and blooms till early in March. Weather conditions are too uncertain during the winter months to favor storing much surplus honey. However, according to Poppleton (Review, Jan., 1893), it is the source of some surplus, and from it the bees are stimulated to begin heavy brood-rearing about Christmas. In an occasional season a fair amount of surplus was secured, sometimes as much as 50 pounds per colony. The honey is said to be light in color, good flavor and heavy body—a first-class article.

Blooming as it does in the winter months, it is invaluable to the beekeeper whose bees have access to it. If no surplus is secured, it serves to fill the hives with bees and honey at an important season and to prepare for the later crops to follow.

Fig. 148. Wild pennyroyal.

**WILD RADISH, see Radish.**
**WILD SUNFLOWER, see Sunflower.**
**WILD SWEET POTATO VINE, see Bluevine.**
**WILD THYME, see Thyme.**

**WILLOW (Salix).**

In the Northern States the blooming of the pussy willow **(Salix discolor)** is among the first signs of spring. It is a small tree, growing along streams and on wet lands. Furnishing as it does about the first honey of the season, as well as pollen in abundance, it is highly regarded by the beekeepers.

There are about 160 species of willows, mostly confined to the cooler and temperate regions of North America. Some species extend their ranges into the Arctic regions, where the vegetation is sparse. While the number of varieties is not so great in the Southern States, it is regarded as valuable in the Gulf States and in California. As an example of the comparative abundance of willows North and South, it may be mentioned that four species are recorded for Alabama and eighteen for Connecticut. The willows bloom too early in the spring in the Northern States for the bees to store surplus from this source, but both nectar and pollen are supplied for early brood-rearing.

In Richter's "Honey Plants of California" I find reference to numerous localities where surplus has been secured from the willows. It is said to be "a dark amber and bitter honey." In a few other southern localities surplus yields from willow are reported. The flowers on one tree will be staminate and on another pistillate. Unlike most plants, the organs of both sexes are not found on the same plant.

Fig. 149. The pussy willow is one of the first trees to bloom in the North.

**WILLOW HERB, see Fireweed.**
**WINTER HUCKLEBERRY, see Farkle-Berry.**

**WISCONSIN—Honey Flora of.**

The more important honey plants of Wisconsin, named in the order they bloom, are: Dandelion, May 1 to June 1; white and alsike clover, furnishing most of the surplus honey, June 1 to August 1; basswood or linden, July 1 to July 20; sweet clover, July 15 to August 15; willow herb, or fireweed, buckwheat, goldenrod, Spanish needle, asters and many fall flowers, in late summer and fall.—N. E. and L. V. France, Bulletin 264, Agr. Ex. Sta. Wisconsin.

**WISTERIA.**

The wisteria is a climbing vine widely grown as an ornamental. There are several varieties introduced from the Old World. They are attractive to the bees, but probably nowhere sufficiently common to be of much value.

**WOLF BERRY, see Oleaster.**
**WOODBINE, see Virginia Creeper.**
**WOOD SAGE, see Germander.**
**WOOLY WHITE DROUGHT WEED, see Turkey Mullein.**

**WYOMING—Honey Sources of.**

Alfalfa and sweet clover yield large amounts of surplus honey in irrigated valleys. Willows, gum-weed, cleome, dandelion, etc are minor sources.

# XYZ

**YAUPON, see Holly.**

**YELLOW JASMINE (Gelsemium sempervirens).**

The yellow jasmine is a well-known poisonous climbing vine common to the Southern States from Virginia to Florida and west to Mexico. Its yellow flowers, in short axillary clusters, appear in early spring (February and March) and are very fragrant. The vine climbs over trees to a great height, often 30 feet or more. It yields pollen and probably some nectar. It is reported as poisonous to the bees.

> "For the past nine years I have observed, commencing with the opening of the yellow jasmine flowers, a very fatal disease attacking the young bees and continuing until the cessation of the bloom. The malady would then cease as quickly as it came. The symptoms of the poisoning are: The abdomen becomes very much distended, and the bees act as though intoxicated. There is great loss of muscular power. The bee, unless too far gone, slowly crawls out of the hive and very soon expires. The deaths in twenty-four hours, in strong stocks with much hatching brood, may amount to one-half pint, often much more. My observations have been verified by dozens of intelligent beekeepers breeding pure Italians where **Gelsemium** abounds."—Dr. J. P. H. Brown, American Bee Journal, Nov., 1879.

As to the effect on animals poisoned by the plant we quote Pammel as follows:

> "Dr. Winslow gives the toxicological effect on animals as follows: Muscular weakness, especially in the forelegs, staggering gait and falling. These symptoms are followed by convulsive movements of the head, forelegs and sometimes of the hindlegs. The respiration is

slow and feeble, temperature reduced, and there is sweating. Death occurs because of respiratory failure."—Manual of Poisonous Plants.

With reference to the condition described by Dr. Brown, the matter

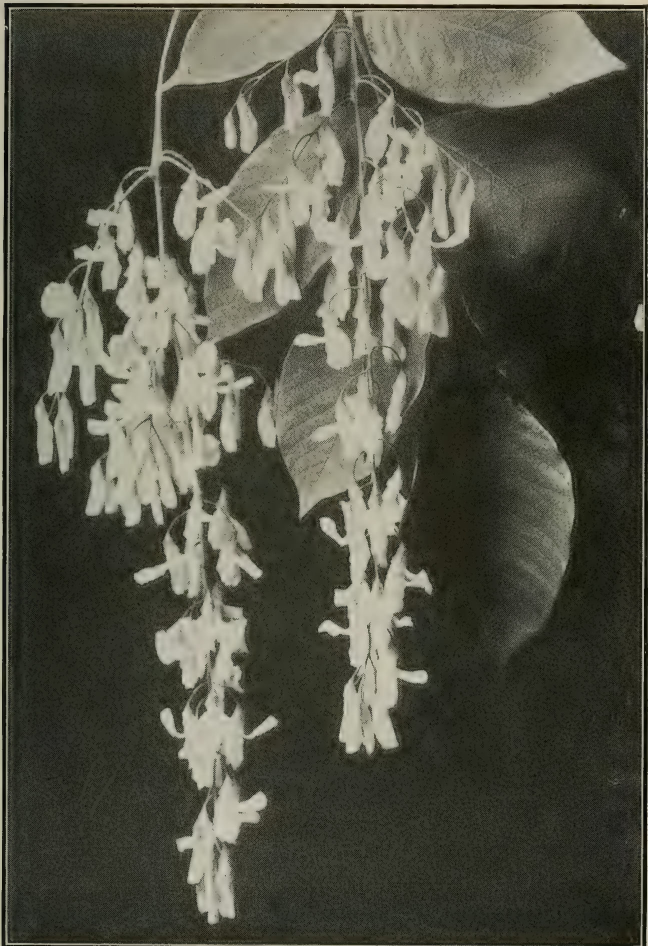


Fig. 150. Blossoms of the yellow-wood.

was referred to T. W. Livingston, of Leslie, Georgia, who writes as follows:

> "I have for many years noticed the disease described. I have seen the same disease where there was no yellow jasmine, that I knew of, but much more of it where that plant was plentiful. It may be caused by it. It was told several years ago by the Florida State Chemist, who had analyzed a sample of honey reported as poisoning some people, that the honey contained pollen grains from yellow jasmine."—March 13, 1919.

**YELLOW POPLAR, see Tulip Tree.**

**YELLOW STAR THISTLE, see Star Thistle.**

**YELLOW-TOPS, see Tarweed.**

Fig. 151. Yucca filamentosa on the lawn of the late Eugene Secor.

**YELLOW WOOD (Cladrastis lutea).**

The yellow wood is a tree confined to a limited range. It is found

principally in Kentucky, Tennessee and North Carolina. While it may occur to some extent in the States adjoining the three mentioned, it is rare, except in very limited areas. It is recorded as occurring on shaded bluffs in the Tennessee Valley in Alabama, and may be looked for in similar situations in Mississippi, Georgia or South Carolina. The flowers are white, as may be seen from Figure 150, and appear in April and May. The panicles are sometimes a foot long. According to the notes furnished by J. M. Buchanan, the honey has a strong, distinctive flavor and is light amber in color.

Fig. 152. The Spanish bayonet is a showy plant when in bloom.

The wood is heavy and hard and yields a yellow dye. It is known also as Kentucky yellow wood and gopher wood.

**YERBA BUENA (Micromeria chamissonis).**

Yerba buena is a trailing perennial herb with slender stem and small, white, solitary flowers. Jepson gives the range as common in woods near the coast: Humboldt County, Marin County, Berkeley, San Francisco, Belmont, Monterey and southward to southern California.

Richter states that it is considered a fair honey plant in places.

**YERBA DEL PESCADO, see Turkey Mullein.**

**YERBA SANTA (Eriodictyon trichocalyx).**

Yerba santa is a low shrub common to some parts of California. Rich-

ter lists it as important in Ventura County, where it frequently yields surplus, blooming in June and July.

**YUCCA.**

Over vast areas of the arid west there is little for the bees. A few plants stand the long continued periods of drought even where there is no irrigation, and add to the total production of the apiaries in the irrigated regions. Among the attractive plants may be mentioned the yucca, also called Spanish bayonet, Spanish dagger, Adam's needle, mountain queen and Roman candle. There are about a dozen species, mostly from Dakota west to the Pacific and southward. They are common in Mexico and Central America. They are also to be found in the sandy sections along the Atlantic Coast from North Carolina to Florida and Louisiana.

When in bloom the plant is very ornamental. A single tall flower stalk contains many large, white or cream-colored flowers. In many localities where the plant does not grow wild, it is grown for ornament, as in Figure 151, which shows the late Eugene Secor admiring a beautiful specimen that grew on his grounds.

In "Honey Plants of California," Richter lists **Yucca whipplie** as an important source of nectar, which, in localities where it is abundant, yields surplus. In that State its blooming period is June and July.

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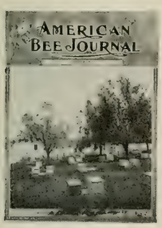


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